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COMMONWEALTH OF MASSACHUSETTS

SUMMARY OF WATER QUALITY 1984

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Massachusetts Department of Environmental Quality Engineering

DIVISION of WATER POLLUTION CONTROL

Thomas C. McMahon, Director

COMMONWEALTH OF MASSACHUSETTS

SUMMARY OF WATER QUALITY

1984

Massachusetts Department of Environmental Quality Engineering
Division of Water Pollution Control
Technical Services Branch

Westborough, Massachusetts
May 1984

PUBLICATION #13,726-150-50-8-84-C.R.
APPROVED BY: Daniel Carter, Purchasing Agent

EXECUTIVE SUMMARY

Through the combination of the NPDES and Construction Grants programs, the classic BOD-DO, solids and aesthetics problems in the surface waters of Massachusetts have been eliminated to a great extent. As of 1984, 47% of river miles and 69% of harbor square miles assessed met fishable/swimmable standards. Eighty-seven percent of the lakes and ponds acreage assessed was in the oligotrophic or mesotrophic category. Partial use support, particularly coliform violations, was met in 44% of river miles and 22% of harbor square miles assessed. A large fraction of those segments in partial or nonsupport will comply with fishable/swimmable standards in the next few years, because of municipal projects, that are presently under construction. The value of proper operation and maintenance of existing facilities is recognized, and is administered through a new technical assistance section of the Regulatory Branch.

The present focus is on the complex problems of combined sewer overflows, toxic contamination and eutrophication. These problems are difficult to assess and expensive to correct. The likelihood of successful abatement projects being funded decreases as federal support lessens.

Health issues are part of the shift away from BOD-DO issues. PCB contamination of New Bedford Harbor and the Housatonic River resulted in fish consumption advisories. The acreage of open shellfishing remains static because the number of beds opened recently equals the number closed. The issuance of EPA priority pollutant criteria has aided the assessment of wildlife health effects, which result from various levels of exposure to trace elements and toxic organic compounds. Protection of the Commonwealth's groundwater resources is now provided through groundwater discharge permitting, resource information maps, and a cleanup program.

Surface water monitoring has expanded recently to meet evolving needs to include: harbor assessments, toxicologic sampling, eutrophication analyses, and combined sewer overflow studies. The lakes program continues to document ambient conditions and develop lake restoration/preservation schemes. Toxicity testing (bioassay) is being applied to effluent evaluation and in-stream assessments.

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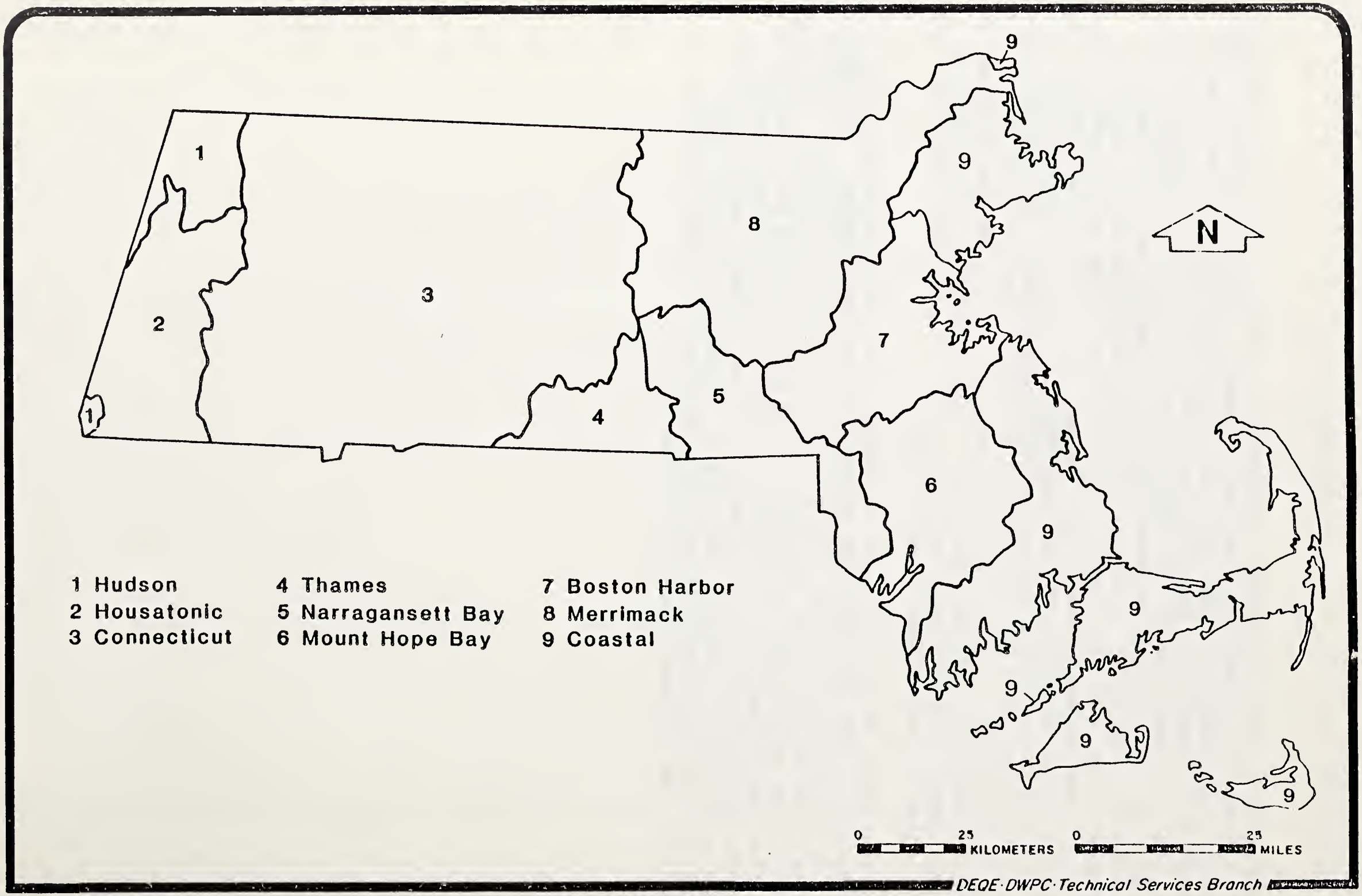
INTRODUCTION

The waters of the Commonwealth of Massachusetts have been subjected to degradation from various sources such as domestic sewage, industrial chemicals, urban runoff, and atmospheric deposition. Water quality problems were amplified as population increased and industrial development intensified. Often untreated or poorly treated wastewater was disposed into the nearest waterbody with little regard for the quality of the receiving water. The problems associated with wastewater disposal and stormwater runoff have been recognized for decades by members of the scientific community and to varying degrees by the general populace. Stern and expensive measures were necessary to retard and eliminate the degradation of the waters of the Commonwealth. The vehicle to re-establish the quality of the water resources was provided by the landmark legislation passed by Congress in 1972 - the amendments to the Federal Water Pollution Control Act, Public Law 92-500. This act set forth goals and a policy for the attainment of desired water quality across the nation. Most importantly, the act provided funds necessary to finance the vast water pollution abatement projects necessary to achieve and maintain water quality goals.

Section 305(b) of the Clean Water Act requires each State to submit a biennial report to the EPA describing the quality of its navigable waters. This report is to include the following: an analysis of the extent to which the State's waters provide for healthy shellfish, fish, and wildlife populations and recreation in and on the water, an analysis of the extent to which pollution control actions have achieved this level of water quality, and recommendations for needed additional actions, an estimate of the environmental impacts, economic and social costs and benefits, and date of achieving this level of water quality; and a description of the nature and extent of nonpoint sources of pollution and recommendations for their control.



1 Hudson
2 Housatonic
3 Connecticut
4 Thames
5 Narragansett Bay
6 Mount Hope Bay
7 Boston Harbor
8 Merrimack
9 Coastal

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Figure 1

COMMONWEALTH OF MASSACHUSETTS DRAINAGE SYSTEMS

BACKGROUND

The Commonwealth of Massachusetts, one of the six New England States, has significant freshwater, coastal and groundwater resources. These aqueous resources are monitored and regulated by the Department of Environmental Quality Engineering. Table 1 below presents a summary of surface waters.

TABLE 1

MASSACHUSETTS ATLAS

Population (1982)	5,737,037
Total surface area (mi^2)	8,257
Number of drainage basins	32
Total river miles	10,704
Number of lakes and ponds	2,859
Area of lakes and ponds (acres)	150,341
Area of marsh and wetland (acres)	362,165
Total coastal miles	1,519
Area of harbors (mi^2)	164

The aquatic life and public health concerns of these water resources is described in detail in the body of this report.

SURFACE WATER QUALITY

Analysis of those surface waters for which monitoring data are available is summarized below. Data are available for 1630 of 10,704 river miles (15.2%), 71,487 of 150,341 acres of lakes and ponds (47.6%), and 138 of 164 square miles of harbors (84.1%). These data are presented in a semi-tabular form. The designated uses and water quality standards can be found in Appendix I.

Status

Data reflecting 1984 ambient conditions were used to evaluate the surface waters of the Commonwealth.

Rivers

Number of miles supporting the designated use(s)	771
Numbers of miles partially supporting the designated use(s)	722
Number of miles not supporting the designated use(s)	137
Total river miles	1630
Number of miles supporting fishable/swimmable use	764
Number of miles where attainment of a fishable/swimmable use is anticipated	1373
Number of miles where attainment of a fishable/swimmable use will never be reached	227
Number of miles unknown	44

River miles where fishable/swimmable uses are anticipated were calculated from the following equation:

(Miles presently meeting fishable/swimmable) + (Miles of noncompliance caused by industrial and municipal sources) + (90% of miles of noncompliance resulting from CSO and stormwater inputs) = Miles anticipated

River miles where attainment of fishable/swimmable uses are not anticipated were calculated from the following equation:

(Miles of noncompliance caused by natural conditions and in-place sediments) + (10% of miles of noncompliance resulting from CSO and stormwater inputs) = Miles not anticipated

Combined sewer overflows and stormwater inputs, although correctable, are expensive to eliminate completely. For this reason, ten percent of those miles of noncompliance are assumed to never meet fishable/swimmable uses.

Lakes & Ponds

Acres supporting designated uses	44,013
Acres partially supporting designated use(s)	24,345
Acres not supporting designated use(s)	3,129
Total acres	71,487
Eutrophic acres	5,546
Mestrophic acres	26,211
Oligotrophic acres	11,603
Unknown acres	28,127

An outline of the lakes classification program and the methodology employed in determining trophic state is found in Appendix II.

Harbors

Square miles supporting designated use(s)	95
Square miles partial supporting designated use(s)	30
Square miles not supporting designated use(s)	13
Total square miles	138
Square miles supporting fishable/swimmable uses	95
Square miles where attainment of fishable/swimmable uses are anticipated	30
Square miles where attainment of a fishable/swimmable use will not be reached	13

Fishable/swimmable uses are precluded in a few harbors because of toxic and trace element contamination, and heavy water traffic from navigation.

Wetlands

The Division of Wetlands is responsible for enforcing the provisions of the Wetland Protection Act and acting as the appeal agency to local conservation commissions. The provisions of the Wetland Protection Act protect the public interest by regulating fisheries, groundwater, land containing shellfish, flood control, prevention of pollution, storm damage prevention and groundwater used as drinking water. The jurisdiction of the Act, however, is limited to land subject to flooding (100 year flood plain) and to land within 100 feet of a wetland.

Updated regulations to the Wetland Protection Act (310 CMR 10.00) were promulgated on April 1, 1983 and established stringent limitations on the filling of wetlands. In summary, filling is prohibited unless four conditions are met: (a) the wetland is isolated; (b) the volume of water is less than 1/4 acre-feet; (c) the bottom is impermeable; and (d) the filling does not displace water onto neighboring property.

Unfortunately, the number of acres of wetlands lost is not readily available. It is known that the number of orders to proceed in 1983 (3300) is about equal to the total number of orders given in the previous five years. This increase in activity was probably due to the desire to get approval under the old regulations.

Changes in Water Quality

In the period from 1982-1984, there have been very few significant water quality improvements: the surface waters of the Commonwealth have been maintained in this period. The major difference is a larger data base, in both extent (number of sampling stations) and depth (variety of chemical and biological parameters). Many water quality improvement projects, although being implemented, are in construction phases, the Construction Grants Program (205(g)) process, or have been constructed so recently that water quality improvements have not yet been measured.

Causes of Nonsupport of Designated Uses

River and harbor data were reviewed for causes of nonsupport of designated uses. Important causes in Massachusetts are presented in Table 2: industrial and municipal discharges, combined sewer overflows, in-place sediments, urban runoff and natural conditions.

The large fraction of nonsupport resulting from municipal sources is as much a result of a need for sewering (i.e., poorly operating septic systems) as a need for existing plant upgrading.

Relative Assessment of Major Parameters of Concern

The major parameters of concern in Massachusetts are, in decreasing order of importance, coliform bacteria, toxic substances (generally PCB and trace elements), dissolved oxygen, and nutrients.

Coliform bacterial contamination is the most frequent violation of water quality. Presence of excess coliform bacteria disallows shellfishing and bathing, and indicates a possible human health hazard. Bacterial contamination presents a real economic impact on the shellfishing industry, and exposure to disease-causing agents.

Toxic substances, because of the human, as well as wildlife, health issues, are of concern. PCB contamination of the Housatonic River and New Bedford Harbor required advisories and bars, respectively, on fish consumption. Trace element contamination (often coupled with low ambient dissolved oxygen) cause stressed environments for wildlife and plants.

Dissolved oxygen continues to be a parameter of concern. It is anticipated that much of the excess carbonaceous BOD will be removed in the execution of the Construction Grants Program. Nitrification is a major dissolved oxygen sink. Dissolved oxygen problems also occur frequently in impoundments and/or from algal activity.

Nutrients are a problem because they stimulate algal growth. Algae can cause dissolved oxygen depletion and aesthetic problems from nuisance growth.

Table 2

Percent Cause of Nonsupport of Designated Uses

Basin	Industrial Discharges	Municipal Sources	Combined Sewer Overflows	In-place Sediments	Urban Runoff	Natural Conditions	Unknown
Hoosic	32.5	67.5	0.0	0.0	0.0	0.0	0.0
Housatonic	0.0	3.0	0.0	97.0	0.0	0.0	0.0
Farmington	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Westfield	0.0	73.0	21.2	0.0	5.8	0.0	0.0
Deerfield	0.0	100.	0.0	0.0	0.0	0.0	0.0
Connecticut	0.0	17.2	82.8	0.0	0.0	0.0	0.0
Millers	0.0	85.8	0.0	0.0	0.0	14.2	0.0
Chicopee	11.3	51.0	6.3	0.0	13.0	18.4	0.0
Quinebaug	0.0	100.	0.0	0.0	0.0	0.0	0.0
French	0.0	100.	0.0	0.0	0.0	0.0	0.0
Blackstone	8.2	65.6	12.3	0.0	5.1	8.8	0.0
Ten Mile	0.0	27.0	0.0	26.5	0.0	46.5	0.0
Mount Hope Bay	0.0	68.5	31.5	0.0	0.0	0.0	0.0
Taunton	2.4	41.9	20.0	0.0	5.3	30.4	0.0
Boston Harbor	0.0	58.5	27.6	13.9	0.0	0.0	0.0
Mystic	0.0	0.0	56.0	36.3	0.0	7.7	0.0
Charles	0.0	37.3	27.3	8.7	10.8	16.0	0.0
Neponset	0.0	0.0	36.6	0.0	31.9	31.5	0.0

Table 2 (Continued)

Basin	Industrial Discharges	Municipal Sources	Combined Sewer Overflows	In-place Sediments	Urban Runoff	Natural Conditions	Unknown
Weymouth & Weir	0.0	46.0	7.2	0.0	46.8	0.0	0.0
Nashua	0.0	63.0	5.3	0.0	28.4	3.3	0.0
Concord	0.0	40.8	9.7	0.0	8.6	40.9	0.0
Shawsheen	0.0	0.0	0.0	0.0	50.0	50.0	0.0
Merrimack	4.7	52.6	42.7	0.0	0.0	0.0	0.0
Parker	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ipswich	0.0	100.	0.0	0.0	0.0	0.0	0.0
North Shore							
(river)	0.0	0.0	0.0	0.0	0.0	0.0	100.
(harbor)	6.1	87.8	6.1	0.0	0.0	0.0	0.0
South Shore							
(river)	0.0	56.9	0.0	0.0	0.0	43.1	0.0
(harbor)	0.0	57.1	34.9	0.0	0.0	0.0	8.0
Buzzards Bay							
(river)	0.0	0.0	10.0	10.5	0.0	0.0	79.5
(harbor)	0.0	0.0	55.8	0.0	0.0	0.0	44.2
Cape Cod	0.0	100.	0.0	0.0	0.0	0.0	0.0
Islands	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rivers	2.9	44.8	15.1	9.1	8.8	14.2	5.1
Harbors	1.7	82.2	11.3	1.9	0.0	0.0	2.9

Toxic Parameters and Public Health/Aquatic Life Concerns

The geographic extent to which toxics contamination excludes the designated use is 113 river miles and 13 square miles of harbors. These data are unknown for lakes and ponds because this information is not routinely collected.

Contamination by polychlorinated biphenyls (PCB) has caused fish consumption concerns in New Bedford Harbor and the Housatonic River. Fishing in New Bedford Harbor is banned until such time that abatement projects, i.e. dredging, have significantly improved PCB levels in the water column and fish. An advisory on fish consumption was issued on the Housatonic River in Massachusetts, and a zero creel limit is imposed on the Housatonic River in Connecticut. This advisory, like New Bedford, is subject to improvement in fish tissue PCB concentrations from proposed dredging projects.

To date, 51 wells, one reservoir and four wellfields are closed due to contamination by toxic chemicals (see also Groundwater Quality).

Contamination of sediments and water column from trace element discharges is evident in the Ten Mile River, Wading River, Blackstone River, Mystic River, Salem Sound and Boston Inner Harbor. These elevated metals concentrations result from industrial, municipal and CSO discharges. There are not yet any fish consumption concerns.

In the Commonwealth of Massachusetts there are about 42,000 acres of coastal and estuarine tidal flats and deep water areas that contain shellfish. About 58% or 23,700 acres are classified open to harvest for direct marketing. About 27% or 11,000 acres are considered contaminated and prohibited to harvest for human consumption. Fifteen percent or 6,000 acres are considered mildly contaminated (restricted or conditional classification) and subject to harvest with depuration (treatment) for human consumption.

While shellfish areas on the North Shore have shown some positive reclassification of previously polluted areas, this positive action has been offset by reclassification to prohibited areas in southern Massachusetts.

The restricted shellfish areas are mildly contaminated only by coliform bacteria. Contamination by radionuclides, trace metals, toxic chemicals or serious coliform levels results in the closure of an area. Additionally, red tide (Gonyaulax tamarensis) blooms result in the temporary closure of shellfish beds. The red tide problem has been an annual phenomenon since 1972; the limit of toxin for human consumption is 100 ug/100 g edible meat.

No statewide statistics on bathing beach closures are available. Each municipality is responsible for closing beaches. Although state agencies may post or publish coliform concentrations, it is the responsibility of the city or town to act on them. The minimum standard for coliform (the municipality may adopt a stricter standard) is 1000 total coliform/100 ml or 200 fecal coliform/100 ml. This standard is in transition.

The Commonwealth of Massachusetts has investigated an average of eight fish kills per year in the last eight years. There are a number of reasons or factors which determine the amount and extent of fish kills in a given body of water. Fish kills range from small numbers of a certain species to massive total kills of an entire lake or river segment. Many small fish kills are reported each year which can be attributed to natural causes and therefore are not investigated by State personnel.

In inland waters, there are four major causes of fish kills. The most common and highly devastating type of fish kill is known as winter kill. The underlying factor responsible for winter kill is a dissolved oxygen depletion. Winter kill almost always occurs in shallow eutrophic lakes with large fish populations. Winter kills in many cases is a total kill or a large percentage of all species present.

The second most common type of fish kill is associated with viral and bacterial infections. These types of kills usually occur around spawning time and involve specific species or families of fish. The explanation lies in the fact that post-spawning stress, and possibly overcrowding, allow viruses or bacteria to proliferate, resulting in the death of the individual. This is most commonly seen as small numbers of a specific fish usually sunfish (Lepomis sp.).

The third most common and and probably the most serious type of fish kill is that caused by toxic substances introduced into the environment. These include oil spills, pesticide spraying, herbicide application, industrial discharges, and high concentrations of chlorine or ammonia discharged in the effluent of sewage treatment plants. Invertebrates, birds, plants, and any inhabitants of the aquatic environment can become victims of such incidents. In 1976, North Pond in Hopkinton had a fish kill after applications of the herbicide Silvex. In 1980, Powdermill Brook, a tributary of the Westfield River, suffered a total kill of all indigenous species in a segment as a result of an acid spill. Clear Pond in Plymouth also suffered a fish kill in 1980; this was attributed to spraying of cranberry bogs with the pesticide Malathion. These types of incidents can be controlled through sound application practices when using pesticides and herbicides and the proper storage and disposal of hazardous materials.

Menhaden (Brevootia tyrannus) are the fish most commonly affected in our bays, harbors, and coastal environment. Menhaden swim in large thick schools of thousands of individuals. They are followed and devoured by many predators, the most common of which is the bluefish (Pomatomus saltatrix). Bluefish are known to drive menhaden onto shore in large numbers. It is also believed that bluefish drive large schools of menhaden into harbors and bays where a change of water quality can kill them in large numbers.

Special Concerns/Remaining Problems

Acid rain is a special and complicated problem for the state. Acid rain is threatening the water quality throughout the state, however, the Department recognizes that many things besides water quality are affected by acid rain. The decline in aquatic life, forest and building damage and the leaching of nutrients and heavy metals from soil or pipes are all the result of acid rain.

In addition to lower pH levels everywhere, low alkalinity levels have caused the greatest concern. Several ponds on Cape Cod no longer support the ecosystem that once flourished, while a declining smelt population in the Quabbin Reservoir threaten the food supply of various fish species. Approximately $1,000,000/yr is spent on treating the drinking water from Quabbin Reservoir, (the largest public water supply system in the state) a large part of which is used to raise the pH in order to prevent heavy metals from leaching from household pipes.

The state is currently researching treatment techniques and monitoring damage status. For example, a study to test drinking water for heavy metals is proposed. This study will show the extent of elevated heavy metals due to corrosive water reacting with household pipes.

The state will continue its research and efforts to win federal cooperation. The acid rain situation is recognized as a very real problem in Germany, Sweden, Belgium, England and Canada, and is showing effects in California, Colorado and Florida. Only strong action at the federal level will ease this problem.

A municipal O&M Technical Assistance Branch within DEQE is being organized. Municipal wastewater facilities, whether new AWT or old trickling filter plants, require proper operation and maintenance to operate efficiently constantly. The two treatment plants for metropolitan Boston process 50% of the wastewater flow in the Commonwealth. These plants have severe maintenance problems which cause frequent bypassing of the treatment process, lack of proper screening, inadequate disinfection, and power failures.

Expertise in evaluating, analyzing and abating toxics contamination is being promoted and developed. Because toxics pose a human health hazard, visibility of those issues is high. Toxics monitoring is becoming more routine, and the availability of EPA water quality criteria makes evaluation easier. A bioassay program is also being developed to assess whole effluent samples, instead of component-by-component evaluation which ignores antagonism and synergy.

Basin/Segment Information

A summary by drainage basin, of miles or square miles assessed and those meeting water quality standards is found in Table 3. Appendix III contains 30 detailed drainage basin summaries. Each synopsis contains a narrative basin description, a basin map which shows water quality violations (shaded areas), and a table of water quality segments. The synopses appear in basin order, as given in Table 3 and Figure 1. The segment tables have eight elements:

- Segment Description: A verbal description of the bounds of the river segment or harbor;
- River Miles: Inclusive mile points of the segment, where 0.0 is the mouth of the river, or the area of a harbor in square miles;
- Water Use Classification: See Appendix I;
- Standards Violations;
- Data Base Year(s);
- Water Quality Problems: Those parameters which cause a segment not to meet its designated use, or those caused by natural conditions;
- Source(s) of Problems: Natural or anthropogenic inputs which cause noncompliance; and
- Abatement Needs to Meet Classification.

TABLE 3

BASIN WATER QUALITY SUMMARY

Basin	Total Assessed	Total Meeting Standards	Percent Meeting Standards
Hoosic	39.8 mi	10.0 mi	25.1
Housatonic	84.2 mi	21.8 mi	25.9
Farmington	25.6 mi	25.6 mi	100.0
Westfield	106.0 mi	71.6 mi	67.5
Deerfield	79.2 mi	66.9 mi	84.5
Connecticut	79.9 mi	60.7 mi	76.0
Millers	48.5 mi	25.9 mi	53.4
Chicopee	134.5 mi	86.7 mi	64.5
Quinebaug	38.1 mi	20.8 mi	54.6
French	32.2 mi	11.9 mi	37.0
Blackstone	84.9 mi	36.0 mi	42.4
Ten Mile	22.6 mi	3.7 mi	16.4
Mount Hope Bay	7.3 mi	0.0 mi	0.0
Taunton	174.9 mi	48.8 mi	27.9
Boston Harbor	46.31 mi^2	40.58 mi^2	87.6
Mystic	25.9 mi	0.0 mi	0.0
Charles	90.7 mi	62.0 mi	68.3
Neponset	32.6 mi	11.0 mi	33.7
Weymouth & Weir	13.7 mi	1.3 mi	9.5
Nashua	87.6 mi	8.0 mi	9.1
Concord	88.8 mi	25.8 mi	29.0
Shawsheen	25.0 mi	0.0 mi	0.0
Merrimack	83.1 mi	15.6 mi	18.8
Parker	22.0 mi	22.0 mi	100.0
Ipswich	41.1 mi	40.1 mi	97.6
North Shore	27.44 mi^2	15.19 mi^2	55.4
	28.5 mi	5.5 mi	19.3
South Shore	17.21 mi^2	13.46 mi^2	78.2
	43.3 mi	25.9 mi	59.8
Buzzards Bay	6.58 mi^2	4.52 mi^2	68.7
	85.7 mi	63.7 mi	74.3
Cape Cod	31.05 mi^2	12.36 mi^2	39.8
Islands	9.12 mi^2	9.12 mi^2	100.0
TOTAL	1630 mi	771.3 mi	47.3
	137.71 mi^2	95.23 mi^2	69.2

GROUNDWATER QUALITY

As of 1982, 54% of Massachusetts communities derived their drinking water from groundwater sources with an additional 24% using combined surface and groundwater sources. A total of 51 wells, 1 reservoir and 4 wellfields have been closed due to chemical contamination. Two wells in Provincetown are experiencing saltwater intrusion (sodium levels 20-100 mg/l) due to temporary excessive pumping. This excessive pumping is necessary in order to replace water lost to chemical contamination.

In response to this need for control, the Department is committed to developing a program to insure groundwaters meet the standards for their intended use, given public health, economic and technical constraints. Program elements are outlined below.

DEQE is responsible for the coordination of groundwater protection and management. An inventory of Massachusetts groundwater related programs has been prepared, a Groundwater Steering Committee has been formed and a bimonthly newsletter is circulated.

A review of laws, regulations and policies will be performed to summarize current authority and identify deficiencies.

DEQE has developed a "Water Supply Protection Atlas" to assess the potential for contamination of ground and surface water supplies. The Atlas consists of overlays which identify public drinking water supplies, known sources of groundwater contamination, potential areas of groundwater favorability and surface drainage divides.

DEQE is developing a priority evaluation system to better focus limited resources on most severe problems and standardizing enforcement procedures, facility design, siting, etc.

Groundwater contamination cleanup is funded by two programs. The Division of Hazardous Waste uses a revolving fund to provide monies to clean up spills of hazardous materials. The Division of Water Supply has been funded by a ten million dollar bond issue, to prevent and clean up contamination of public water supplies. For groundwater protection, an additional bond issue for ten million dollars was recently funded to develop an aquifer protection program for the purchase of land and development rights to further protect existing groundwater supply sources.

DEQE recognizes the need to develop new programs to include research and development, allocation of groundwater, groundwater monitoring, hydrogeological study procedures and groundwater classification.

WATER POLLUTION CONTROL PROGRAM

Point Source Control Program

The $1.49 billion spent on municipal facilities in the past ten years, along with improvement in industrial discharges has improved the riverine water quality from 444/444/723 miles (supporting use/partially supporting/not supporting) in 1972 to 764/722/158 miles in 1984. The quality of industrial discharges has improved because good treatment facilities were built, companies tied-in to municipal sewerage systems, or companies went out of business. The major problems with industrial discharges are treated plating wastes to low flow streams, and needs for pretreatment. Significant segments of the Hoosic, Millers, Charles and Merrimack Rivers have improved significantly from municipal facilities construction.

The counterpoint to facilities construction is permit compliance. The percentage of municipal facilities compliance grew from 8% in 1972 to 60% in 1982. Similarly, industrial facilities compliance increased from 47% to 86% in those ten years. Presently, 46 municipal facilities are out of compliance: 26 are in need of O&M or technical assistance, or are hydraulically overloaded; 20 are under construction for expansion or upgrading. Eleven industrial facilities are in significant noncompliance - they will receive notice of violations, administrative orders or technical assistance.

Nonpoint Source Control Program

Although waste inputs to Massachusetts rivers and harbors are highly dominated by point sources, much of the toxics loading originates from nonpoint sources. Impacts on lakes and ponds largely result from nonpoint sources, particularly sedimentation and eutrophication. Table 4 contains a summary of nonpoint source impacts.

Table 4

SEVERITY AND EXTENT OF NONPOINT SOURCE CONTRIBUTIONS

TYPE OF NPS	EXTENT	SEVERITY	PRIMARY PARAMETERS
urban	L	S	C, SS, OD, N
agriculture (nonirrigated)	L	M	N, P, C
animal wastes	L	I	N, C
silviculture	L	I	N
failing septic systems	L	M	C, N
construction	L	I	T, SS
hydrologic modification	W	M	LF, OD
saltwater intrusion	L	M	S
residual waste /landfill	W	M	M, P, C, OD

--- EXTENT ---
W = widespread (50% or more of the State's waters are affected)
M = moderate (25% to 50% of the State's waters are affected)
L = localized (less than 25% of the State's waters are affected)

-- SEVERITY --
S = severe (des. use is impaired)
M = moderate (des. use is not precluded, partial support)
I = minor (des. use is almost always supported)

-- PRIMARY PARAMETERS --
C = coliforms
LF= low flow
M = metals
N = nutrients
OD= oxygen demand
P = pesticides/herbicides
S = salinity
SS= suspended solids
T = turbidity

Table 5
Existing and Recommended Nonpoint Source Control Programs

TYPE OF NONPOINT SOURCE	TYPE OF CONTROL PROGRAM	
	EXISTING	RECOMMENDED
urban	S, R	F
agriculture (nonirrigated)	E	R
animal wastes	--	--
silviculture	--	--
failing septic systems	S, E, R, F	--
construction	R	E
hydrological modifications	R	S, E
saltwater intrusions	--	--
residual waste/ landfill	S, R	T

-- TYPE OF CONTROL PROGRAM --

S = structural/public works
E = education
T = tech. assistance
F = financial incentives
R = regulation
O = other

With the control of the vast majority of point source discharges over the past decade, the evaluation of the effect of nonpoint sources (NPS) has become a reasonable goal. The major components of NPS which have water quality impacts are urban runoff, nutrient loadings from agricultural and dairy lands, and groundwater contamination. The problem has been addressed from three major areas: 208 programs presented a general overview of NPS on a state-wide basis and made general recommendations such as institution of street sweeping programs to control loadings from urban runoff and implementation of best management practices (BMP's) for control of agricultural and dairy runoff. The U.S. Soil Conservation Service has undertaken site specific evaluations of nutrient loadings to lakes and coliform bacteria loadings from dairy land runoff. The Division of Water Pollution Control has evaluated through water quality surveys the effect of stormwater runoff upon the nutrient and coliform bacteria loadings to several streams in Massachusetts. The findings have been incorporated into the decision process of establishing point source effluent limits and, in some cases, the NPS have been more significant than point sources.

Most implementation of NPS control is conducted on a local level such as street sweeping, road salt containment and fertilizer application control. Concern is mounting over groundwater contamination from NPS; some communities have initiated watershed management programs to control NPS impacts.

Lakes and ponds are more severely impacted by NPS than rivers in Massachusetts. Direct point discharges to lakes are nearly non-existent; thus, watershed management plans to control NPS are an integral part of lake restoration projects. Studies in Massachusetts have demonstrated that BMP's can be effective in reducing NPS.

The ubiquitous nature of NPS makes its impact serious and its control difficult. The future programs for control will consist of protection of existing waterbodies and the implementation of localized BMP's.

Monitoring Program

River and Harbor Monitoring

Surveys conducted on the rivers and harbors of the Commonwealth normally include all major components (including tributaries and wastewater inputs). These surveys are composed of physical, chemical and biological parameters (see Table 6), and are generally conducted during two weeks of summer low flow conditions.

Table 6
Average Survey Analyses

Type	Parameter
Physical	Flow
	Temperature
	Transparency
	Suspended solids
	pH
Chemical	Dissolved oxygen
	BOD
	Nutrients
	Chlorides
	Trace elements
Biological	Chlorophyll a
	Coliform bacteria
	Phytoplankton

River stations are located at dams, above and below discharges and tributaries, and at changes in the water quality standards. Harbor station locations are based on circulation patterns and known waste inputs. River samples are generally hand-composited 24-hour samples. Harbor samples are grab samples. All miles (1644) and square miles (138) assessed in this report have water quality data histories. These data are periodically updated based on priority. A description of recent surveys follows in Table 7.

Table 7
Intensive Survey Program

Year	Area	Purpose
1982	Housatonic River	Phosphorus load allocation
	Boston Harbor	Develop data base
	New Bedford Sewer Study	Determine PCB contamination
	Gloucester Harbor	NPDES permit review
	French River	Provide updated data
1983	Connecticut River	Evaluate CSO
	North River	Document improvements
	Boston Harbor	Continue data base
	Salem Sound	Develop data base
1984 (planned)	Connecticut River	Evaluate CSO
	Ten Mile River	Industrial permit reviews
	Boston Harbor	Continue data base

Lakes and Ponds Monitoring

The Division's Lakes Monitoring Program was formally initiated in the summer of 1974; it was expanded in 1979 with the inception of EPA's 314 Program. Two different sampling programs are conducted by the lakes section: baseline surveys and intensive surveys.

A baseline survey consists of bathymetric mapping, qualitative and density mapping of the vascular aquatic plants, chemical, bacteriological and biological sampling of the open water areas. Chemical and bacteriological samples are also taken of the natural inlets and the outlet. The lake is sampled once during the summer months.

Intensive lake surveys consist of a minimum of six surveys conducted during a one-year period with sampling performed in each season. Physical, chemical and biological data are collected during each sampling run as in the baseline surveys. Historical, cultural and soils watershed information are later gathered to supplement the water quality data.

The results of these surveys are necessary to achieve the objectives of the Lakes Monitoring Program. Baseline data are used to classify the lakes and ponds of Massachusetts. This information will aid in developing a comprehensive lake restoration-preservation program and aid in evaluating the impact of shoreline development on these lakes and ponds. To date, 391 lakes and ponds have been classified.

Biological Monitoring

In 1973, the Division initiated an extensive program of benthic macroinvertebrate sampling with the objectives of: 1) determining the suitability of aquatic

environments for supporting healthy and diverse indigenous communities; 2) providing accurate taxonomic baseline data on benthic organisms for future comparative water quality evaluations; 3) providing data useful in the detection of the presence of hazardous or toxic substances in the aquatic environment, and 4) establishing reliable and consistent methods of data analysis to define the water quality responses of benthic macroinvertebrate communities.

Bioassay and Toxicity Testing Program

Toxicity testing is conducted under a cooperative agreement with the EPA Laboratory at Lexington, and as sponsored, experimental work at the University of Massachusetts at Amherst. The approach is a three-tiered analysis: using EPA criteria documents, conducting effluent toxicity tests, and performing instream assessments. The EPA laboratory conducts acute toxicity tests using Pimephales promelas (fathead minnow), Daphnia spp., Mysidopsis bahia (mysid shrimp); chronic tests using Ceriodaphnia sp., and sediment toxicity tests using Chironomus sp. (midge). The University of Massachusetts conducts algal assays using Selanastrum capricornutum, acute toxicity tests using P. promelas and Daphnia spp., and sediment toxicity tests using the Microtox analyzer (a luminescent bacterium).

The data generated by this program are used to standardize testing and reporting procedures and ultimately to establish NPDES permit limits. The data may also be used to establish the water quality and uses of segments, or may be used as an input to fate modeling.

Compliance Monitoring

The National Pollutant Discharge Elimination System (NPDES) was established as part of PL92-500. It requires all dischargers of pollutants to a waterbody to obtain a permit to discharge. A pollution abatement schedule may be established to fulfill the goals of NPDES. Monitoring of these wastewater discharges is required to assure compliance with the terms of the discharge permits and is performed by the Division. This monitoring is coordinated when possible with the sampling of treatment facilities for operation and maintenance purposes and with the water quality sampling to provide data for the mathematical models. Approximately 125 discharges are sampled each year. Discharge samples range from 24-hour composites on major municipal facilities to grab samples on some minor industrial discharges. The parameters for analysis on each sample will depend upon the nature of the discharge and the terms of the discharge permit.

Special Studies

Use attainability studies were completed on the Assabet River (water quality limited stream with five existing municipal wastewater treatment plants), and are in progress on the Connecticut River (seven municipalities with combined sewerage systems).

Monitoring of Boston Harbor was designed to be an annual survey. The harbor is subject to CSO and municipal discharges (which have applied under §301(h)). It is a major recreational resource, and is heavily used for lobstering and fishing. The surveys are designed to document ambient water quality and address specific current concerns.

RECOMMENDATIONS

Special Concerns

- Abatement of water pollution resulting from oil and hazardous materials spills.
- Proper operation and maintenance of the large number of municipal facilities built.
- Attainment of water quality standards in the state's receiving waters.
- Proper containment and elimination of abandoned hazardous waste sites.
- Eutrophication of lakes and ponds.
- Continued monitoring to identify problem areas and to document improvements in surface water quality.

Remaining Problems

- Surface water quality maintenance and/or quantity assurance in light of population and industrial growth.
- Groundwater resource quality protection or supply assurance.
- Identification and control of toxic pollutants from industrial and non-point sources.
- Municipal wastewater plant operation, maintenance, and rehabilitation.
- Pollution arising from abandoned industrial facilities.
- Source funding for needed abatement projects is unclear due to the projected decrease in federal funds.
- Chronic toxicity and bioaccumulation are difficult to evaluate on a wide-scale basis.
- Rehabilitation of the infrastructure of the municipal facilities.

APPENDIX I

Commonwealth of Massachusetts

Water Resources Commission

Division of Water Pollution Control

MASSACHUSETTS SURFACE WATER QUALITY STANDARDS

4.01: GENERAL PROVISIONS

(1) Title. These regulations shall be known as the "Massachusetts Surface Water Quality Standards."

(2) Organization of Standards. These standards comprise five units: General Provisions (314 CMR 4.01), Application of Standards (314 CMR 4.02), Water Quality Criteria (314 CMR 4.03), Antidegradation Provisions (314 CMR 4.04), and Basin Classification and Maps (314 CMR 4.05).

(3) Authority. The Massachusetts Surface Water Quality Standards are adopted by the Division pursuant to the provisions of M.G.L. c.21, §27.

(4) Purpose. The Massachusetts Act charges the Division with the duty and responsibility to enhance the quality and value of the water resources of the Commonwealth and directs the Division to take all action necessary or appropriate to secure to the Commonwealth the benefits of the Federal Act. The objective of the Federal Act is the restoration and maintenance of the chemical, physical and biological integrity of the Nation's waters. To achieve the foregoing requirements the Division has adopted these standards which designate the uses for which the various waters of the Commonwealth shall be enhanced, maintained and protected; which prescribe the water quality criteria required to sustain the designated uses; and which contain regulations necessary to achieve the designated uses and maintain existing water quality including, where appropriate, the prohibition of discharges.

(5) Definitions. As used in these standards, the following words have the following meanings:

Artificial conditions - Those conditions resulting from human alteration of the chemical, physical or biological integrity of waters.

Beneficial use - Any use not impairing the most sensitive use designated in the classification tables contained in 314 CMR 4.05; except that in no case shall the assimilation or transport of pollutants be deemed a beneficial use.

Cold water fishery - Waters whose quality is capable of sustaining a year-round population of cold water trout (salmonidae).

Division - The Massachusetts Division of Water Pollution Control, as established by General Laws c.21, §26.

Discharge - Any addition of any pollutant to the waters of the Commonwealth.

EPA - The United States Environmental Protection Agency.

Federal Act - The Federal Water Pollution Control Act, as amended, 33 U.S.C. §§1251, et seq.

Massachusetts Act - The Massachusetts Clean Waters Act, as amended, General Laws, c.21, §§26-53, inclusive.

Pollutant - Any element or property of sewage, agricultural, industrial or commercial waste, runoff, leachate, heated effluent, or other matter, in whatever form and whether originating at a point or major nonpoint source, which is or may be discharged, drained or otherwise introduced into any sewerage system, treatment works or waters of the Commonwealth.

Primary contact recreation - Any recreation or other water use, such as swimming and water skiing, in which there is prolonged and intimate contact with the water sufficient to constitute a health hazard.

Seasonal cold water fishery - Waters whose quality is capable of sustaining only an extremely limited cold water population on a year-round basis, with cold water fish in these streams provided largely by stocking.

Secondary contact recreation - Any recreation or other water use in which contact with the water is either incidental or accidental, such as fishing, boating and limited contact incident to shoreline activities.

Segment - A finite portion of a water body established by the Division for the purpose of classification.

Warm water fishery - Waters whose quality is not capable of sustaining a year-round cold water or seasonal cold water fishery.

Waters of the Commonwealth - All waters within the jurisdiction of the Commonwealth, including, without limitation, rivers, streams, lakes, ponds, springs, impoundments, estuaries and coastal waters, but not including groundwaters.

(6) Severability. If any provision of these standards is held invalid, the remainder of these standards shall not be affected thereby.

(7) Repealer. The "Rules and Regulations for the Establishment of Minimum Water Quality Standards and for the Protection of the Quality and Value of Water Resources" filed with the Secretary of the Commonwealth on May 2, 1974 and the "River Basin Classifications" filed with the Secretary of the Commonwealth on July 21, 1967 are hereby repealed, except that all permits, orders, determinations or other actions of the Division, based

upon such standards and river basin classifications, and any court actions seeking to enforce such standards, permits, orders and determinations shall remain in full force and effect until modified, amended, revoked or reissued by the Division and/or the courts of the Commonwealth, as appropriate.

(8) Effective Date. These standards shall become effective upon publication by the Secretary of the Commonwealth pursuant to the provisions of M.G.L. c.30A, §6.

4.02: APPLICATION OF STANDARDS

(1) Establishment of Effluent Limitations. In regulating discharges of pollutants to waters of the Commonwealth, the Division will limit or prohibit such discharges to insure that the water quality standards of the receiving waters will be maintained or attained. The determination by the Division of the applicable level of treatment for an individual discharger will be made in the establishment of effluent limitations in the individual discharge permits in accordance with 314 CMR 3.10(3), (4), (5) and (6). In establishing water quality based effluent limitations, the Division must consider natural background conditions, existing discharges, must protect existing downstream uses, and must not interfere with the maintenance and attainment of beneficial uses in downstream waters. Toward this end, the Division may provide a reasonable margin of safety to account for any lack of knowledge concerning the relationship between the pollutants being discharged and their impact on the quality of the receiving waters.

(2) Mixing Zones. In applying these standards, the Division may recognize, where appropriate, a limited mixing zone or zone of initial dilution on a case-by-case basis. The location, size and shape of these zones shall provide for the maximum protection of aquatic resources. At a minimum, mixing zones must:

a) Meet the criteria for aesthetics;

b) Be limited to an area or volume that will minimize interference with the designated uses or established community of aquatic life in the segment:

c) Allow an appropriate zone of passage for migrating fish and other organisms; and

d) Not result in substances accumulating in sediments, aquatic life or food chains to exceed known or predicted safe exposure levels for the health of humans or aquatic life.

(3) Hydrologic Conditions. The Division will determine the most severe hydrologic condition at which water quality standards must be met. In classifying the inland waters of the Commonwealth and in applying these standards to such waters, the critical low flow condition at and above which these standards must be met is the average minimum consecutive seven-day flow to be expected once in ten years, unless otherwise stated by the

Division in these standards. In artificially regulated waters, the critical low flow will be established by the Division through agreement with the Federal, state or private interest controlling the flow. The minimum flow established in such agreement will become the critical low flow under this section for those waters covered by the agreement.

(4) Procedures for Sampling and Analysis. For the purpose of collecting, preserving and analyzing samples in connection with these water quality standards, the fourteenth edition of Standard Methods of the Examination of Water and Wastewater published by the American Public Health Association, or Methods for Chemical Analysis of Water and Wastes published by the U.S. Environmental Protection Agency should be used. Where a method is not given in these publications, the latest procedures of the American Society for Testing Materials (ASTM) shall be used, or any other equivalent method approved by the Director.

4.03: MINIMUM WATER QUALITY CRITERIA AND ASSOCIATED USES

(1) Description of Contents. This part sets forth the Classes to be used by the Division in classifying the waters of the Commonwealth according to the uses for which the waters shall be enhanced, maintained and protected. For each class, the most sensitive beneficial uses are identified and minimum criteria for water quality in the water column are established. In interpreting and applying the minimum criteria in 314 CMR 4.03(4), the Division shall consider EPA guidance established in accordance with Section 304(b) of the Federal Act as it applies to local conditions including, but not limited to:

a) The characteristics of the biological community;

b) Temperature, weather, flow, and physical and chemical characteristics; and

c) Synergistic and antagonistic effects of combinations of pollutants.

(2) Coordination with Federal Criteria. The Division will use the EPA publication entitled Quality Criteria for Water, EPA-440/9-76-023 as guidance in establishing case-by-case discharge limits for pollutants not specifically listed in these standards but included under the heading "Other Constituents" in 314 CMR 4.03(4), for identifying bioassay application factors and for interpretations of narrative criteria. Where the minimum criteria specifically listed by the Division in this part differ from those contained in the federal criteria, the provisions of the specifically listed criteria in these standards shall apply.

(3) Classes and Designated Uses. The waters of the Commonwealth will be assigned to one of the classes listed below. Each class is defined by the most sensitive, and therefore governing, uses which it is intended to protect. The classes are:

Classes for Inland Waters

Class A - Waters assigned to this class are designated for use as a source of public water supply.

Class B - Waters assigned to this class are designated for the uses of protection and propagation of fish, other aquatic life and wildlife; and for primary and secondary contact recreation.

Class C - Waters assigned to this class are designated for the uses of protection and propagation of fish, other aquatic life and wildlife; and for secondary contact recreation.

Classes for Coastal and Marine Waters

Class SA - Waters assigned to this class are designated for the uses of protection and propagation of fish, other aquatic life and wildlife; for primary and secondary contact recreation; and for shellfish harvesting without depuration in approved areas.

Class SB - Waters assigned to this class are designated for the uses of protection and propagation of fish, other aquatic life and wildlife; for primary and secondary contact recreation; and for shellfish harvesting with depuration (Restricted Shellfish Areas).

Class SC - Waters assigned to this class are designated for the protection and propagation of fish, other aquatic life and wildlife; and for secondary contact recreation.

(4) Minimum Criteria. The following minimum criteria are adopted and shall be applicable to all waters of the Commonwealth.

A. These minimum criteria are applicable to all waters of the Commonwealth, unless criteria specified for individual classes are more stringent.

	Parameter	Criteria
1.	Aesthetics	All waters shall be free from pollutants in concentrations or combinations that: a) Settle to form objectionable deposits; b) Float as debris, scum or other matter to form nuisances; c) Produce objectionable odor, color, taste or turbidity; or d) Result in the dominance of nuisance species.
2.	Radioactive Substances	Shall not exceed the recommended limits of the United States Environmental Protection Agency's National Drinking Water Regulations.

3.	Tainting Substances	Shall not be in concentrations or combinations that produce undesirable flavors in the edible portions of aquatic organisms.
4.	Color, Turbidity, Total Suspended Solids	Shall not be in concentrations or combinations that would exceed the recommended limits on the most sensitive receiving water use.
5.	Oil and Grease	The water surface shall be free from floating oils, grease and petrochemicals and any concentrations or combinations in the water column or sediments that are aesthetically objectionable or deleterious to the biota are prohibited. For oil and grease of petroleum origin the maximum allowable discharge concentration is 15 mg/l.
6.	Nutrients	Shall not exceed the site-specific limits necessary to control accelerated or cultural eutrophication.
7.	Other Constituents	Waters shall be free from pollutants in concentrations or combinations that: a) Exceed the recommended limits on the most sensitive receiving water use; b) Injure, are toxic to, or produce adverse physiological or behavioral responses in humans or aquatic life; or c) Exceed site-specific safe exposure levels determined by bioassay using sensitive resident species.

B. Inland Waters - the following additional minimum criteria are applicable to inland water classifications.

For Class A waters:

	Parameter	Criteria
1.	Dissolved Oxygen	Shall be a minimum of 5.0 mg/l in warm water fisheries and a minimum of 6.0 mg/l in cold water fisheries.
2.	Temperature	Shall not exceed 83°F (28.3°C) in warm water fisheries or 68°F (20°C) in cold water fisheries nor shall the rise resulting from artificial origin exceed 4.0°F (2.2°C).

3.	pH	As naturally occurs.
4.	Total Coliform Bacteria	Shall not exceed a log mean for a set of samples of 50 per 100 ml during any monthly sampling period.
5.	Turbidity	None other than of natural origin.
6.	Total Dissolved Solids	Shall not exceed 500 mg/l.
7.	Chlorides	Shall not exceed 250 mg/l.
8.	Sulfates	Shall not exceed 250 mg/l.
9.	Nitrate	Shall not exceed 10 mg/l as nitrogen.

For Class B waters:

	Parameter	Criteria
1.	Dissolved Oxygen	Shall be a minimum of 5.0 mg/l in warm water fisheries and a minimum of 6.0 mg/l in cold water fisheries.
2.	Temperature	Shall not exceed 83°F (28.3°C) in warm water fisheries or 68°F (20°C) in cold water fisheries, nor shall the rise resulting from artificial origin exceed 4.0°F (2.2°C).
3.	pH	Shall be in the range of 6.5-8.0 standard units and not more than 0.2 units outside of the naturally occurring range.
4.	Fecal Coliform Bacteria	Shall not exceed a log mean for a set of samples of 200 per 100 ml, nor shall more than 10% of the total samples exceed 400 per 100 ml during any monthly sampling period, except as provided in 314 CMR 4.02(1).

For Class C waters:

	Parameter	Criteria
1.	Dissolved Oxygen	Shall be a minimum of 5.0 mg/l in warm water fisheries and a minimum of 6.0 mg/l in cold water fisheries.
2.	Temperature	Shall not exceed 83°F (28.3°C) in warm water fisheries or 68°F (20°C) in cold water fisheries, nor shall the rise

		resulting from artificial origin exceed 4.0°F (2.2°C).
3.	pH	Shall be in the range of 6.5-9.0 standard units and not more than 0.2 units outside of the naturally occurring range.
4.	Fecal Coliform Bacteria	Shall not exceed a log mean for a set of samples of 1000 per 100 ml, nor shall more than 10% of the total samples exceed 2500 per 100 ml during any monthly sampling period, except as provided in 314 CMR 4.02(1).

C. Coastal and Marine Waters - the following additional minimum criteria are applicable to coastal and marine waters.

For Class SA waters:

	Parameter	Criteria
1.	Dissolved Oxygen	Shall be a minimum of 85 percent of saturation at water temperatures above 77°F (25°C) and shall be a minimum of 6.0 mg/l at water temperatures of 77°F (25°C) and below.
2.	Temperature	None except where the increase will not exceed the recommended limits on the most sensitive water use.
3.	pH	Shall be in the range of 6.5-8.5 standard units and not more than 0.2 units outside of the naturally occurring range.
4.	Total Coliform Bacteria	Shall not exceed a median value of 70 MPN per 100 ml and not more than 10% of the samples shall exceed 230 MPN per 100 ml in any monthly sampling period.

For Class SB waters:

	Parameter	Criteria
1.	Dissolved Oxygen	Shall be a minimum of 85 percent of saturation at water temperatures above 77°F (25°C) and shall be minimum of 6.0 mg/l at water temperatures of 77°F (25°C) and below.
2.	Temperature	None except where the increase will not exceed the recommended limits on the most sensitive water use.

3.	pH	Shall be in the range of 6.5-8.5 and not more than 0.2 units outside of the naturally occurring range.
4.	Total Coliform Bacteria	Shall not exceed a median value of 700 MPN per 100 ml and not more than 20% of the samples shall exceed 1000 MPN per 100 ml during any monthly sampling period, except as provided in 314 CMR 4.02(1).

For Class SC waters:

	Parameter	Criteria
1.	Dissolved Oxygen	Shall be a minimum of 85 percent of saturation at water temperatures above 77°F (25°C) and shall be a minimum of 6.0 mg/l at water temperatures of 77°F (25°C) and below.
2.	Temperature	None except where the increase will not exceed the recommended limits on the most sensitive water use.
3.	pH	Shall be in the range of 6.5-8.5 standard units and not more than 0.2 units outside the naturally occurring range.
4.	Fecal Coliform Bacteria	Shall not exceed a log mean for a set of samples of 1000 MPN per 100 ml, nor shall more than 10% of the total samples exceed 2500 MPN per 100 ml during any monthly sampling period, except as provided in 314 CMR 4.02(1).

4.04: ANTIDEGRADATION PROVISIONS

(1) Protection of Existing Uses. In all cases, from and after the date these regulations become effective, the quality of the waters of the Commonwealth shall be maintained and protected to sustain existing beneficial uses.

(2) Protection of High Quality Waters. From and after the date these regulations become effective, waters designated by the Division in 314 CMR 4.05(5) whose quality is or becomes consistantly higher than that quality necessary to sustain the national goal uses shall be maintained at that higher level of quality unless limited degradation is authorized by the Division. Limited degradation may be allowed by the Division as a variance from this regulation as provided in 314 CMR 4.04(6).

(3) Protection of Low Flow Waters. Certain waters will be designated by the Division in Regulation 5.5 of these standards for pro-

tection under this section due to their inability to accept pollutant discharges. New or increased discharges of pollutants to waters so designated are prohibited unless a variance is granted by the Division as provided in 314 CMR 4.04(6).

(4) National Resource Waters. Waters which constitute an outstanding national resource as determined by their outstanding recreational, ecological and/or aesthetic values shall be preserved. These waters shall be designated for preservation by the Division in 314 CMR 5.05(5) of these standards. Waters so designated may not be degraded and are not subject to a variance procedure. New discharges of pollutants to such waters are prohibited. Existing discharges shall be eliminated unless the discharger is able to demonstrate that:

a) Alternative means of disposal are not reasonably available or feasible; and

b) The discharge will not affect the quality of the water as a national resource.

(5) Control of Eutrophication. The discharge of nutrients, primarily phosphorus or nitrogen, to waters of the Commonwealth will be limited or prohibited by the Division as necessary to prevent excessive eutrophication of such waters. There shall be no new or increased discharges of nutrients into lakes and ponds, or tributaries thereto. Existing discharges containing nutrients which encourage eutrophication or growth of weeds or algae shall be treated. Activities which may result in nonpoint discharges of nutrients shall be conducted in accordance with the best management practices reasonably determined by the Division to be necessary to preclude or minimize such discharges of nutrients.

(6) Variances. A variance to authorize a discharge in water designated for protection under 314 CMR 4.04(2) may be allowed by the Division where the applicant demonstrates that:

(a) The proposed degradation will not result in water quality less than specified for the class; and

(b) The adverse economic and social impacts specifically resulting from imposition of controls more stringent than secondary treatment to maintain the higher water quality are substantial and widespread in comparison to other economic factors and are not warranted by a comparison of the economic, social and other benefits to the public resulting from maintenance of the higher quality water. In making such evaluation, the Division will apply, where appropriate, guidance documents published by EPA.

In addition to the above, the applicant for a variance to authorize a discharge into waters designated for protection under 314 CMR 4.04(3) must demonstrate that:

(c) Alternative means of disposal are not reasonably available or feasible.

In any proceeding where such variance is at issue, the Division shall circulate a public notice in accordance with the procedures set forth in M.G.L. c.30A, §3. Said notice shall state that a variance is under consideration by the Division, and indicate the Director's tentative determination relative thereto. To the extent feasible, the variance proceeding shall be conducted as part of any pending discharge permit proceedings pursuant to M.G.L. c.21, §43. In any variance procedure, the burden of proof relative to justifying the variance shall be on the part requesting the variance. Any variance granted pursuant to this regulation shall not extend beyond the expiration date of the permit.

4.05: BASIN CLASSIFICATIONS AND MAPS

(1) Description of Contents. This part sets forth the procedures and guidelines the Division must follow in classifying the waters of the Commonwealth, and the classifications themselves. The procedural rules for classifying are contained in 314 CMR 4.05(2) through 4.05(4). 314 CMR 405(5) contains maps and tabulations identifying the assignment by the Division of each segment to one of the classes set forth in 314 CMR 4.03 of these Standards, the designation of uses and associated criteria for that segment and the imposition of special limitations in 314 CMR 4.04(2) through 4.04(4) to that segment.

(2) Designation of Uses. In determining the appropriate classification for a particular water, the Division must fulfill its statutory mandate as set forth in 314 CMR 4.01(4) of these standards. Wherever attainable, the Division shall designate the national goal uses of protection and propagation of fish, shellfish, aquatic life and wildlife and recreation in and on the waters in classifying the waters of the Commonwealth. In determining whether the national goal uses are attainable for a given water, the Division has considered limitations imposed by natural conditions, irreversible artificial conditions and the availability of feasible technological treatment methods and designated the optimum number of beneficial uses attainable in the circumstances.

(3) Other Applicable Standards. Waters classified by the Division in 314 CMR 4.05 may be subject to additional restrictions pursuant to federal or Massachusetts statutes and regulations. Where such additional restrictions are known they are noted in the classifications in 314 CMR 4.05 Where these restrictions impose requirements more stringent than required under the Massachusetts or Federal Acts, e.g. public health restrictions relative to water supplies, such restrictions shall be considered and applied by the Division in classifying the waters to the extent authorized in the Massachusetts Act.

(4) Fisheries Designations. For inland waters certain specific criteria become applicable on the basis of their designation as a particular type of fishery. Therefore, inland segments are designated as cold water, seasonal cold water or warm water fisheries. In seasonal cold water fisheries criteria for cold water fisheries apply during the period of September 15 through June 30 annually, and criteria for warm water fisheries apply at all other times.

Where the Division determines that natural conditions prevent the attainment of water quality capable of supporting a warm water fishery, a use designation of aquatic life has been made. In each segment so designated in 314 CMR 4.05(5), the criteria for a warm water fishery apply for constituents except those affected by the natural condition, which constituents shall be governed by the most sensitive resident species as determined by the Director in consultation with the Massachusetts Division of Fisheries and Game.

(5) Classifications. For the purpose of applying the Massachusetts Water Quality Standards, the waters of the Commonwealth are hereby classified as shown in the following tables which are a part of these regulations. Columns 1 and 2 of the tables describes the segment. Column 3 identifies the applicable classification of the segment. Column 4 identifies the use or uses for which the segment is designated; (P&S) means primary and secondary contact recreation, (Sn) means seasonal fishery, (O) means open shellfishing, (R) means restricted shellfishing. Column 5 identifies the applicable provisions of 314 CMR 4.04 and 314 CMR 4.05(3).

Segments and their classifications are shown on maps for general orientation. In case of inconsistancy between the tables and the maps, the data contained in the table shall control.

APPENDIX II

MASSACHUSETTS LAKE CLASSIFICATION PROGRAM

In accordance with Public Law 95-217, Section 314 (the "Clean Lakes" section of the 1977 Amendments to the Federal Water Pollution Control Act), the Massachusetts Division of Water Pollution Control developed a lake classification program based upon the trophic condition of all publicly owned freshwater lakes and ponds in the Commonwealth.

The Massachusetts Clean Lakes and Great Ponds Program was created under Chapter 628 of the Acts of 1981. An integral part of that program is the prioritization of publicly owned lakes and ponds for the purpose of providing financial assistance to municipalities for diagnostic-feasibility studies and implementation projects. The prioritization process is composed of several elements, one of which is the trophic status of lakes and ponds. The Division utilizes the Lake Classification Program as the basis for awarding priority points in the trophic status category.

A lake or pond is classified according to the system described in this report. The first step in this process is a baseline limnological survey of the lake or pond. This survey is generally conducted in one day and consists of bathymetric mapping of the lake; physical, chemical and biological sampling of the open water areas, tributary stream(s), and outlet; and a quantitative and qualitative mapping of the aquatic macrophyton community in the lake. The primary purpose of this survey is to classify the lake by its trophic status and identify any point and nonpoint sources of pollution. To date the Division has conducted 391 baseline surveys on waterbodies throughout the state.

LAKE CLASSIFICATION SYSTEM

The Division of Water Pollution Control has developed a lake classification system as an aid to setting priorities for the Massachusetts Clean Lakes and Great Ponds Program (Chapter 628 of the Acts of 1981) in Massachusetts. This system is generally applied only to those lakes and ponds for which the Division has collected water quality data. Although a host of physical, chemical, and biological parameters are measured during the normal lake survey, only six critical parameters are employed in the lake classification priority system. The six parameters are hypolimnetic dissolved oxygen, secchi disc reading, phytoplankton count, total ammonia- and nitrate-nitrogen, total phosphorus, and aquatic macrophyton. The most recent survey data are used and the priority listing is updated annually. The optimum season for collecting lake data is mid to late summer, or during peak biological production. Unfortunately, this cannot always be achieved, thus spring or autumnal data have to be used in the lake classification system.

The limits used for awarding severity points for the six parameters have been based on several considerations and information sources. These include lake classifications of other states, the natural range of parameters in Massachusetts, limnological texts, and accepted indices of euthrophication reported in the literature. The severity point system has been formulated as follows:

PARAMETER	CONCENTRATION OR DEGREE OF SEVERITY	POINTS
Hypolimnetic dissolved oxygen	≥5.0 mg/l	0
	<5.0-3.0 mg/l	1
	<3.0-1.0 mg/l	2
	<1.0 mg/l	3
Transparency (secchi disc reading)*	≥15 feet (4.6 meters)	0
	<15-10 feet (4.6-3.0 meters)	1
	<10-4 feet (3.0-1.2 meters)	2
	<4 feet (1.2 meters)	3
Phytoplankton	0-500 cells/ml	0
	>500-1000 cells/ml	1
	>1000-1500 cells/ml	2
	>1500 cells/ml or summer "blooms"	3
Epilimnetic NH_3 + NO_3-N	0-<0.15 mg/l	0
	≥0.15-0.3 mg/l	1
	>0.3-0.5 mg/l	2
	>0.5 mg/l	3
Epilimnetic total phosphorus	0-0.01 mg/l	0
	>0.01-0.05 mg/l	1
	>0.05-0.10 mg/l	2
	>0.10 mg/l	3

* Four feet is the minimum allowable transparency at bathing beaches, as stated in Article VII of the State Sanitary Code.

Aquatic Vegetation	Sparse	0
	Medium	1
	Dense	2
	Very Dense	3

It is expected that chlorophyll-a data will soon augment or replace the phytoplankton data as they become part of the routine lake survey. The severity points may be interpreted as follows:

0 = No problem. Considered to be representative of clean water quality.

1 = Slight problem; borderline case considered to be potentially degrading.

2 = Definite problem. Considered unacceptable for lake water quality.

3 = Severe problem, undoubtedly causing degradation of the lake's water quality or some recreational uses.

Lakes, ponds, reservoirs, and impoundments are first divided into two major categories:

1. Those which stratify during the summer; and

2. Those which do not stratify during the summer.

Next, severity points are assigned to each of the above critical parameters. On the basis of the severity point system, a priority listing can be maintained. This listing, in conjunction with other available data, can then be used for a trophic level classification system. On the basis of a possible 18 severity points, the trophic level index would be as follows:

0 - 6	oligotrophic
6 - 12	mesotrophic
12 - 18	eutrophic

The overlap of severity points is intentional and meant to underscore the system's flexibility. The general range of severity points is considered more important than the absolute total for a given lake.

Although the system is not 100% equitable, it does appear to give a fair representation of lake trophic conditions for the vast majority of Massachusetts' lakes. River impoundments below point waste discharges present special cases. Personal knowledge of these situations helps explain anomalies in the data. By its very nature, the system cannot be static but will be under constant reevaluation as new data become available.

CLASSIFIED LAKES AND PONDS

S = Stratified
U = Unstratified

LAKE/POND	AREA (ACRES)	LOCATION	DRAINAGE BASIN	STRATIFICATION	SEVERITY POINTS
Aldrich Lake	66	Granby	Connecticut	S	12
Althea Lake	38	Tyngsborough	Merrimack	S	11
Ames Pond	82	Tewksbury	Shawsheen	U	7
Arcadia Lake	40	Belchertown	Connecticut	U	6
Lake Archer	79	Wrentham	Charles	S	9
Ashfield Pond	39	Ashfield	Deerfield	S	8
Ashland Reservoir	155	Ashland	Concord	S	5
Ashmere Lake	217	Hinsdale/Peru	Housatonic	U	5
Ashumet Pond	203	Mashpee	Cape Cod	S	7
Lake Attitash	335	Amesbury/ Merrimac	Merrimack	U	5
Attleboro Gravel Pit #1	-	Attleboro	Ten Mile	U	4
Attleboro Gravel Pit #2	-	Attleboro	Ten Mile	U	3
Augmentation Pond	333	Westborough	Concord	S	14
Babson Farm Quarry	-	Rockport	North Shore	S	10
Baddacook Pond	76	Groton	Nashua	S	7
Baker Pond	28	Orleans	Cape Cod	S	5
Baldpate Pond	55	Boxford	Parker	S	10
Bare Hill Pond	316	Harvard	Nashua	U	11
Barrowsville Pond	38	Norton	Taunton	U	13
Bartholomew Pond	8	Peabody	North Shore	S	6
Bartlett Pond	45	Northborough	Concord	U	7

Lakes and Ponds (Cont'd)

LAKE/POND	AREA (ACRES)	LOCATION	DRAINAGE BASIN	STRATIFICATION	SEVERITY POINTS
Bearse Pond	65	Barnstable	Cape Cod	U	5
Beaver Lake	149	Ware	Chicopee	U	5
Bell Pond	7	Worcester	Blackstone	U	6
Bemis Pond	14	Hubbardston	Chicopee	U	10
Benton Pond	63	Otis	Farmington	U	2
Bent's Pond	9	Gardner	Millers	U	11
Berkshire Pond	22	Lanesborough	Housatonic	U	11
Big Alum Lake	189	Sturbridge	Quinebaug	S	8
Big Bearhole Pond	37	Taunton	Taunton	U	8
Big Pond	331	Otis	Farmington	S	10
Black's Nook	-	Cambridge	Mystic	U	12
Boons Pond	175	Hudson/Stow	Concord	S	11
Bower Springs Conservation Area	2	Bolton	Nashua	U	8
Box Pond	46	Bellingham	Charles	U	15
Brierly Pond	18	Millbury	Blackstone	U	9
Brigham Pond	45	Hubbardston	Chicopee	U	13
Brockton Reservoir	89	Avon	Taunton	S	8
Brooks Pond	190	Spencer/Oakham N. Braintree/ N. Brookfield	Chicopee	S	7
Browns Pond	26	Peabody	North Shore	S	7
Buck Pond	25	Westfield	Westfield	S	11
Buckley-Dunton Lake	195	Becket	Westfield	U	7
Burr's Pond	5	Seekonk	Narragansett Bay	S	15

LAKE/POND	AREA (ACRES)	LOCATION	DRAINAGE BASIN	STRATI-FICATION	SEVERITY POINTS
Lake Buel	194	Monterey/New Marlborough	Housatonic	S	10
Buffumville Reservoir	186	Charlton/ Oxford	French	S	8
Camp Putnam Pond	-	New Braintree	Chicopee	U	4
Candlelight Pond	8	Templeton	Millers	U	6
Card Pond	12	W. Stockbridge	Housatonic	U	4
Carding Mill Pond	40	Sudbury	Concord	U	13
Cedar Pond	21	Falmouth	Cape Cod	U	4
Cedar Pond	146	Sturbridge	Quinebaug	U	8
Center Pond	125	Becket	Westfield	S	5
Center Pond	30	Dalton	Housatonic	U	5
Chaffin's Pond	104	Holden	Nashua	U	5
Chandler Pond	11	Boston	Charles	U	14
Chartley Pond	38	Norton/ Attleboro	Taunton	U	13
Chase Pond	-	Fall River	Taunton	U	13
Chauncy Lake	177	Westborough	Concord	S	6
Chebacco Lake	209	Hamilton/Essex	North Shore	S	10
Cheshire Reservoir	418	Cheshire/ Lanesborough	Hoosic	U	7
Chicopee Falls Impoundment	-	Chicopee	Chicopee	U	11
Clapps Pond	40	Provincetown	Cape Cod	U	12
Clara Barton Pond	-	Oxford	French	S	9
Cleveland Pond	88	Abington	Taunton	U	12
Cliff Pond	193	Brewster	Cape Cod	S	7

LAKE/POND	AREA (ACRES)	LOCATION	DRAINAGE BASIN	STRATI-FICATION	SEVERITY POINTS
Lake Cochituate (Carling, Middle, North Basins)	361	Framingham/ Natick/Wayland	Concord	S	12
Lake Cochituate (South Basin)	233	Natick	Concord	S	10
Coes Reservoir	90	Worcester	Blackstone	U	10
Comins Pond	-	Warren	Quinebaug	U	5
Congamond Lakes (Middle)	267	Southwick	Westfield	S	13
Congamond Lakes (North)	48	Southwick	Westfield	S	12
Congamond Lakes (South)	135	Southwick	Westfield	S	13
Cook Pond	154	Fall River	Mount Hope Bay	S	12
Cook Pond	20	Worcester	Blackstone	U	9
Cooley Lake	91	Granville	Westfield	U	8
Cow Pond	38	Groton	Nashua	S	7
Coy Pond	25	Wenham	North Shore	U	9
Cranberry Pond	5	Braintree	Weymouth & Weir	U	7
Cranberry Pond	8	Tolland	Farmington	S	8
Crystal Lake	90	Douglas	Blackstone	U	8
Crystal Lake	36	Orleans	Cape Cod	S	7
Damon Pond	88	Chesterfield/ Goshen	Westfield	U	9
Dark Brook Reservoir	57	Auburn	Blackstone	U	10
Davenport Pond	-	Athol/ Petersham	Chicopee	U	9

Lakes and Ponds (Continued)

LAKE/POND	AREA (ACRES)	LOCATION	DRAINAGE BASIN	STRATI-FICATION	SEVERITY POINTS
Lake Dennison	82	Winchendon	Millers	U	8
Depot Pond	25	Eastham	Cape Cod	S	2
Diamond International Impoundment	-	Palmer	Chicopee	U	13
Dimmock Pond	11	Springfield	Connecticut	U	8
Dodgeville Pond	47	Attleboro	Ten Mile	U	13
Dorothy Pond	148	Millbury	Blackstone	U	9
Dudley Pond	84	Wayland	Concord	S	5
Dunn's Pond	18	Gardner	Millers	U	7
Eagle Lake	84	Holden	Nashua	U	6
Lake Rohunta (Eagleville Pond)	250	Athol/Orange/ New Salem	Millers	S	10
East Brimfield Reservoir	420	Brimfield/ Sturbridge	Quinebaug	U	7
East Indies Pond	69	New Marlborough	Housatonic	U	3
East Lake Waushacum	188	Sterling	Nashua	S	4
Echo Lake	123	Hopkinton	Charles	S	3
Eddy Pond	134	Auburn	Blackstone	U	8
Ell Pond	23	Melrose	Mystic	S	10
Lake Elizabeth	7	Barnstable	Cape Cod	U	11
Lake Ellis	67	Athol	Millers	U	9
Factory Pond	45	Hanover/Hanson	South Shore	U	12
Falls Pond	60	N. Attleborough	Ten Mile	S	10
Farm Pond	124	Sherborn	Charles	S	6

LAKE/POND	AREA (ACRES)	LOCATION	DRAINAGE BASIN	STRATI-FICATION	SEVERITY POINTS
Farmers Pond	9	Attleboro	Ten Mile	U	15
Five Mile Pond	36	Springfield	Chicopee	S	6
Flannagan (Fletcher) Pond	87	Ayer	Nashua	U	13
Flax Pond	27	Bourne	Cape Cod	U	5
Flax Pond	15	Dennis	Cape Cod	S	1
Flax Pond	71	Lynn	North Shore	S	13
Flint Pond (North & South)	297	Grafton/ Shrewsbury	Blackstone	U	9
Flint Pond	61	Tyngsborough	Merrimack	U	7
Floating Bridge Pond	8	Lynn	North Shore	U	11
Flushing Pond	18	Westford	Merrimack	S	7
Forest Lake	55	Methuen	Merrimack	S	7
Forge Pond	68	Granby	Connecticut	U	12
Forge Pond	20	Hanover	South Shore	U	16
Forge Pond	198	Westford/ Littleton	Merrimack	S	11
Fort Meadow Reservoir	284	Hudson/ Marlborough	Concord	S	9
Fort Pond	78	Lancaster	Nashua	S	9
Fort Pond	100	Littleton	Concord	S	10
Fosters Pond	135	Andover/ Wilmington	Shawsheen	S	12
Fresh Pond	29	Dennis	Cape Cod	U	7
Frye Pond	7	Haverhill	Merrimack	U	7
Furnace Pond	100	Pembroke	Taunton	U	6

Lakes and Ponds (Continued)

LAKE/POND	AREA (ACRES)	LOCATION	DRAINAGE BASIN	STRATI-FICATION	SEVERITY POINTS
Lake Garfield	262	Monterey	Housatonic	S	9
Lake George	93	Wales	Quinebaug	S	8
Glen Echo Lake	116	Charlton	French	S	10
Goodrich Pond	13	Pittsfield	Housatonic	S	14
Goose Pond	38	Chatham	Cape Cod	S	5
Goose Pond	225	Lee/Tyringham	Housatonic	S	2
Gore Pond	169	Charlton/Dudley	French	S	7
Granite Reservoir	198	Charlton	French	U	4
Great Herring Pond	170	Plymouth	South Shore	S	9
Great Pond	109	Eastham	Cape Cod	S	7
Green Hill Pond	32	Worcester	Blackstone	U	7
Green's Pond	10	Fitchburg	Nashua	U	11
Greenville Pond	30	Leicester	French	S	10
Greenwater Pond	88	Becket	Housatonic	S	3
Gristmill Pond	16	Sudbury	Concord	U	15
Gull Pond	109	Wellfleet	Cape Cod	S	5
Hager Pond	28	Marlborough	Concord	U	12
Halls Pond	2	Brookline	Charles	S	13
Hammond Pond	37	Goshen	Westfield	U	10
Hardwick Pond	68	Hardwick	Chicopee	S	13
Hardy Pond	41	Waltham	Charles	U	12
Harris Pond	12	Ludlow	Chicopee	U	11
Haviland Pond	25	Ludlow	Chicopee	S	7

LAKE/POND	AREA (ACRES)	LOCATION	DRAINAGE BASIN	STRATI-FICATION	SEVERITY POINTS
Hayden Pond	41	Dudley	French	S	1
Heart Pond	91	Chelmsford	Concord	S	7
Hebronville Pond	16	Attleboro	Ten Mile	U	13
Herring Pond	43	Eastham	Cape Cod	S	9
Highland Lake	15	Norfolk	Charles	S	14
Hills Pond	-	Arlington	Mystic	U	8
Hinckley Pond	171	Harwich	Cape Cod	S	8
Hobart Pond	15	Whitman	Taunton	U	14
Hocomonco Pond	27	Westborough	Concord	U	8
Lake Holbrook	32	Holbrook	Weymouth & Weir	U	12
Holland Lake	12	Belchertown	Connecticut	S	8
Holland Reservoir	65	Holland	Quinebaug	S	5
Hood Pond	67	Topsfield/ Ipswich	Ipswich	S	6
Horn Pond	104	Woburn	Mystic	S	10
Horse Pond	30	Westfield	Westfield	U	5
Houghton's Pond	17	Holliston	Charles	U	13
Hoxie Pond	9	Sandwich	Cape Cod	S	11
Ice House Pond	-	Shirley	Nashua	U	8
Indian Lake	190	Worcester	Blackstone	S	9
Island Grove Pond	38	Abington	Taunton	U	13
Jacobs Pond	59	Norwell	South Shore	U	8
Jennings Pond	10	Natick	Charles	U	12
John's Pond	317	Mashpee	Cape Cod	S	10

Lakes and Ponds (Continued)

LAKE/POND	AREA (ACRES)	LOCATION	DRAINAGE BASIN	STRATI-FICATION	SEVERITY POINTS
Johnson's Pond	180	Groveland/ Boxford	Merrimack	S	6
Jordan Pond	20	Shrewsbury	Blackstone	U	11
Kendall Pond	23	Gardner	Millers	S	5
Keyes Pond	40	Westford	Merrimack	S	9
Lackey Pond	117	Uxbridge/ Northbridge	Blackstone	U	12
Lagoon Pond	535	Oak Bluffs/ Tisbury	Islands	U	5
Lake Lashaway	270	East Brookfield/ North Brookfield	Chicopee	S	8
Laurel Lake	51	Erving	Millers	S	7
Laurel Lake	165	Lee/Lenox	Housatonic	S	8
Leadmine Pond	62	Sturbridge	Quinebaug	S	2
Leverett Pond	7	Brookline	Charles	U	9
Leverett Pond	65	Leverett	Connecticut	U	6
Little Pond	16	Bolton	Concord	U	2
Little Alum Pond	73	Brimfield	Quinebaug	S	3
Little Fresh Pond	-	Cambridge	Mystic	U	9
Long Pond	88	Littleton	Concord	S	8
Long Pond	50	Barnstable	Cape Cod	U	7
Long Pond	163	Dracut/ Tyngsborough	Merrimack	U	8
Long Pond	13	Springfield	Connecticut	U	8
Long Pond	34	Wellfleet	Cape Cod	S	2
Long Sought-for Pond	106	Westford	Merrimack	S	6

Lakes and Ponds (Continued)

LAKE/POND	AREA (ACRES)	LOCATION	DRAINAGE BASIN	STRATI-FICATION	SEVERITY POINTS
Loon Pond	29	Springfield	Connecticut	U	6
Lost Pond	2	Brookline	Charles	U	12
Lost Lake/Knops Pond	204	Groton	Nashua	S	7
Lake Lorraine	27	Springfield	Chicopee	S	7
Lowe Pond	32	Boxford	Ipswich	U	5
Lower Highland Lake	88	Goshen	Connecticut	U	4
Lower Mill Pond	32	Easthampton	Connecticut	U	10
Lower Mystic Lake	111	Arlington/ Medford	Mystic	S	15
Lower Naukeag Lake	260	Ashburnham	Millers	U	6
Manchaug Pond	348	Douglas/Sutton	Blackstone	S	3
Maquan Pond	45	Hanson	South Shore	U	7
Mare Pond	14	Plymouth	South Shore	U	5
Martins Pond	92	North Reading	Ipswich	U	10
Mascuppic Lake	209	Dracut/ Tyngsborough	Merrimack	S	14
Mashpee/Wakeby Pond	729	Mashpee	Cape Cod	S	9
Massapoag Pond	353	Sharon	Neponset	S	7
Lake Mattawa	112	Orange	Chicopee	S	5
McTaggart's Pond	9	Fitchburg	Nashua	U	7
Mechanics Pond	9	Attleboro	Ten Mile	U	15
Memorial Park Pond	-	Taunton	Taunton	U	13
Merino Pond	72	Dudley	French	U	2

Lakes and Ponds (Continued)

LAKE/POND	AREA (ACRES)	LOCATION	DRAINAGE BASIN	STRATI-FICATION	SEVERITY POINTS
Metacomet Lake	74	Belchertown	Connecticut	U	7
Mill Pond	34	Littleton	Merrimack	U	12
Mill Pond	17	West Newbury	Merrimack	S	11
Minechoag Pond	21	Ludlow	Chicopee	U	9
Mirror Lake	7	Fitchburg	Nashua	U	8
Mirror Lake	55	Wrentham/ Norfolk	Charles	U	10
Mona Lake	-	Springfield	Connecticut	U	13
Lake Monomonac	592	Winchendon/ Rindge, NH	Millers	U	7
Monponsett Pond (East)	246	Halifax	Taunton	U	7
Monponsett Pond (West)	282	Halifax	Taunton	U	13
Moore's Pond	31	Warwick	Millers	U	4
Morses Pond	116	Wellesley/ Natick	Charles	S	12
Mossy Pond	28	Clinton	Nashua	S	8
Murphy Pond	8	Ludlow	Chicopee	U	10
Musquashcut Pond	71	Scituate	South Shore	U	12
Nabnasset Pond	115	Westford	Merrimack	U	7
Nashawannuck Pond	22	Easthampton	Connecticut	S	11
Nine Mile Pond	32	Wilbraham	Connecticut	S	10
Nipmuc Pond	85	Mendon	Blackstone	S	6
Nippenicket Lake	354	Bridgewater	Taunton	U	7
Lake Noquochoke	124	Dartmouth	Buzzards Bay	S	13

LAKE/POND	AREA (ACRES)	LOCATION	DRAINAGE BASIN	STRATI-FICATION	SEVERITY POINTS
North Spectacle Pond	30	New Salem	Millers	S	9
North Watuppa Pond	1700	Fall River/ Westport	Mount Hope Bay	U	2
Norton Reservoir	529	Mansfield/ Norton	Taunton	U	10
Norwich Pond	122	Huntington	Westfield	S	9
Noyes Pond	166	Tolland	Farmington	U	3
Nutting Lake	78	Billerica	Concord	U	10
Oldham Pond	235	Pembroke	South Shore	U	6
Onota Lake	617	Pittsfield	Housatonic	S	4
Orange Impoundment	-	Orange	Millers	U	14
Otis Reservoir	1200	Otis	Farmington	S	5
The Oxbow	212	Northampton	Connecticut	U	16
Packard Pond	34	Orange	Millers	S	7
Partridge Pond	23	Westminster	Nashua	U	9
Partridgeville Pond	39	Templeton	Millers	U	6
Parker Pond	26	Gardner	Millers	U	7
Patch Pond	3	Worcester	Blackstone	U	8
Lake Pearl	218	Wrentham	Charles	S	12
Pelham Lake	71	Rowe	Deerfield	U	10
Pentucket Pond	85	Georgetown	Parker	S	11
Pepperell Pond	-	Pepperell	Nashua	U	15
Pequot Pond	154	Westfield	Westfield	S	4

Lakes and Ponds (Continued)

LAKE/POND	AREA (ACRES)	LOCATION	DRAINAGE BASIN	STRATI-FICATION	SEVERITY POINTS
Peter's Pond	77	Dracut	Merrimack	S	11
Pierpoint Meadow Pond	90	Charlton/Dudley	French	U	7
Pilgrim Lake	39	Orleans	Cape Cod	S	5
Pillings Pond	96	Lynnfield	North Shore	U	13
Plainfield Pond	57	Plainfield	Deerfield	U	3
Plunkett Reservoir	73	Hinsdale	Housatonic	S	3
Pondville Pond	41	Auburn/Millbury	Blackstone	U	11
Pontoosuc Lake	467	Pittsfield/ Lanesborough	Housatonic	S	11
Populatic Pond	40	Norfolk	Charles	U	11
Porter Lake	28	Springfield	Connecticut	U	15
Prospect Lake	55	Egremont	Housatonic	U	3
Putnam Pond	4	Fitchburg	Nashua	U	10
Quaboag Pond	531	Brookfield/ East Brookfield	Chicopee	U	8
Quacumquasit Pond	218	Brookfield/ East Brookfield Sturbridge	Chicopee	S	6
Queen Lake	138	Phillipston	Chicopee	U	1
Queen Sewell Pond	18	Bourne	Cape Cod	U	2
Lake Quinsigamond	475	Worcester/ Shrewsbury	Blackstone	S	11
Ramshorn Pond	117	Millbury/Sutton	Blackstone	S	3
Red Bridge Impoundment	83	Ludlow/Wilbra-ham/Palmer	Chicopee	S	15
Red Lily Pond	4	Barnstable	Cape Cod	U	12

Lakes and Ponds (Continued)

LAKE/POND	AREA (ACRES)	LOCATION	DRAINAGE BASIN	STRATIFICATION	SEVERITY POINTS
Richmond Pond	218	Pittsfield/ Richmond	Housatonic	S	5
Robbins Pond	124	Bridgewater	Taunton	U	5
Robinson Pond	98	Oxford	French	U	4
Rock Pond	42	Georgetown	Parker	S	12
Rockwell Pond	10	Leominster	Nashua	U	8
Rocky Pond	60	Boylston	Concord	S	2
Rosemary Lake	12	Needham	Charles	U	10
Rubber Thread Pond	-	Easthampton	Connecticut	U	11
Rudd Pond	80	Becket	Westfield	S	6
Russell Pond	85	Russell	Westfield	S	8
Lake Sabbatia	237	Taunton	Taunton	S	11
Salisbury Pond	17	Worcester	Blackstone	U	16
Salt Pond*	62	Falmouth	Cape Cod	S	12
Lake Samoset	44	Leominster	Nashua	S	8
Sandy Pond	74	Ayer	Nashua	S	6
Santuit Pond	172	Mashpee	Cape Cod	U	11
Sargent Pond	2	Brookline	Charles	U	10
Sargents Pond	69	Leicester	French	U	6
Sawdy Pond	363	Westport/Tiverton/Fall River	Mount Hope Bay	U	3
Sawmill Pond	61	Fitchburg	Nashua	U	14

* Tidal Pond

Lakes and Ponds (Continued)

LAKE/POND	AREA (ACRES)	LOCATION	DRAINAGE BASIN	STRATI-FICATION	SEVERITY POINTS
Sassaquin Pond	34	Acushnet	Buzzards Bay	S	5
Scargo Pond	53	Dennis	Cape Cod	S	5
School Pond	-	Boston	Charles	U	11
Schoolhouse Pond	21	Chatham	Cape Cod	S	2
Seth's Pond	11	West Tisbury	Islands	U	3
Shaker Mill Pond	6	West Stock-bridge	Housatonic	U	4
Shallow Pond	67	Barnstable	Cape Cod	U	8
Shaw Pond	100	Becket/Otis	Farmington	S	5
Sheep Pond	148	Brewster	Cape Cod	S	4
Sherman Pond	86	Brimfield	Quinebaug	U	7
Sherman Reservoir	162	Monroe/Rowe/ Whitingham, VT	Deerfield	S	4
Lake Shirley	376	Lunenburg/ Shirley	Nashua	S	11
Shubael Pond	56	Barnstable	Cape Cod	S	6
Silver Lake	10	Agawam	Connecticut	S	13
Silver Lake	70	Bellingham	Blackstone	U	7
Silver Lake	23	Grafton	Blackstone	U	10
Singletary Pond	330	Millbury/ Sutton	Blackstone	S	10
Slater's Pond	107	Oxford	French	S	4
Sluice Pond	50	Lynn	North Shore	S	10
Snake Pond	83	Sandwich	Cape Cod	U	3
Snow's Mill Pond	35	Fitchburg	Nashua	U	6
Spectacle Pond	70	Lancaster	Nashua	S	4
Sportsman's Pond	102	Athol	Millers	U	10

LAKE/POND	AREA (ACRES)	LOCATION	DRAINAGE BASIN	STRATI-FICATION	SEVERITY POINTS
Spy Pond	103	Arlington	Mystic	S	16
South Athol Lake	76	Athol	Millers	U	8
South End Pond	30	Millis	Charles	U	9
South Meadow Pond (East)	68	Clinton	Nashua	S	9
South Meadow Pond (West)		Clinton/ Lancaster	Nashua	U	9
South Spectacle Pond	37	New Salem	Millers	S	11
South Watuppa Pond	1283	Fall River/ Westport	Mount Hope Bay	U	9
Stearn's Mill Pond	19	Sudbury	Concord	U	12
Stiles Pond	60	Boxford	Ipswich	S	8
Stiles Reservoir	346	Leicester/ Spencer	French	S	9
Stockbridge Bowl	374	Stockbridge	Housatonic	S	9
Stoneville Reservoir	55	Auburn	Blackstone	U	5
Straits Pond	91	Cohasset/Hull	Weymouth & Weir	U	9
Sugden Reservoir (Sampled after dam breached. Under normal conditions, severity points may drop).	83	Spencer	Chicopee	U	4
Sunset Lake	300	Ashburnham	Millers	S	12
Sunset Lake	5	Oak Bluffs	Islands	U	9
Sunset Lake	57	Braintree	Weymouth & Weir	S	8
Terry Brook Reservoir	10	Freetown	Taunton	S	10

Lakes and Ponds (Continued)

LAKE/POND	AREA (ACRES)	LOCATION	DRAINAGE BASIN	STRATI-FICATION	SEVERITY POINTS
Texas Pond	27	Oxford	French	U	9
Thayer Pond	9	Oxford	French	U	13
The Reservoir	7	Harwich	Cape Cod	U	9
Thirty Acre Pond	30	Brockton	Taunton	U	4
Tinkham Pond	20	Acushnet/ Mattapoisett	Buzzards Bay	U	14
Tripps Pond	6	Hudson	Concord	U	8
Tully Pond	32	Orange	Millers	S	7
Turner Pond	55	Dartmouth	Buzzards Bay	U	12
Turnpike Lake	115	Plainville	Ten Mile	U	6
Upper Goose Pond	45	Lee/Tyringham	Housatonic	S	4
Upper Highland Lake	53	Goshen	Connecticut	U	4
Upper Mystic Lake	167	Winchester/ Arlington/ Medford	Mystic	S	15
Upton's Pond	7	Tyngsborough	Merrimack	S	11
Van Horn Pond	9	Springfield	Connecticut	S	13
Venture Pond	7	Springfield	Connecticut	U	15
Village Pond	6	Truro	Cape Cod	U	11
Lake Waban	108	Wellesley	Charles	S	9
Waite Pond	54	Leicester	Blackstone	U	5
Waldo Pond	70	Avon/Brockton	Taunton	U	7
Walker Pond	94	Sturbridge	Quinebaug	U	5
Walker Pond	7	Watertown	Charles	U	9

Lakes and Ponds (Continued)

LAKE/POND	AREA (ACRES)	LOCATION	DRAINAGE BASIN	STRATIFICATION	SEVERITY POINTS
Wallum Lake	322	Douglas/Burrillville, RI	Blackstone	S	2
Wampatuck Pond	65	Hanson	Taunton	U	10
Ward Pond	51	Ashburnham	Millers	S	13
Ware Impoundment	-	Ware	Chicopee	S	11
Warner's Pond	54	Concord	Concord	S	10
Warner's Pond	68	Hadley	Connecticut	U	12
Waushakum Pond	81	Ashland/ Framingham	Concord	S	9
Lake Watatic	28	Ashburnham	Millers	U	11
Watershops Pond	157	Springfield	Connecticut	S	10
Wattles Pond	10	Groton	Nashua	S	10
Webster Lake	1181	Webster	French	S	6
Wequaquet Lake	654	Barnstable	Cape Cod	U	5
Western Mass. Electric Impoundment	-	Ludlow/Wilbraham	Chicopee	S	8
West Pond	19	Bolton	Concord	S	8
West Waushacum Pond	112	Sterling	Nashua	S	7
Whalom Pond	99	Leominster/ Lunenburg	Nashua	S	6
Wheeler's Pond	22	Erving	Millers	U	7
Whitehall Reservoir	575	Hopkinton	Concord	S	9
White Pond	67	Athol	Millers	S	10
White Pond	43	Concord	Concord	S	5
White Pond	43	Lancaster	Nashua	U	7

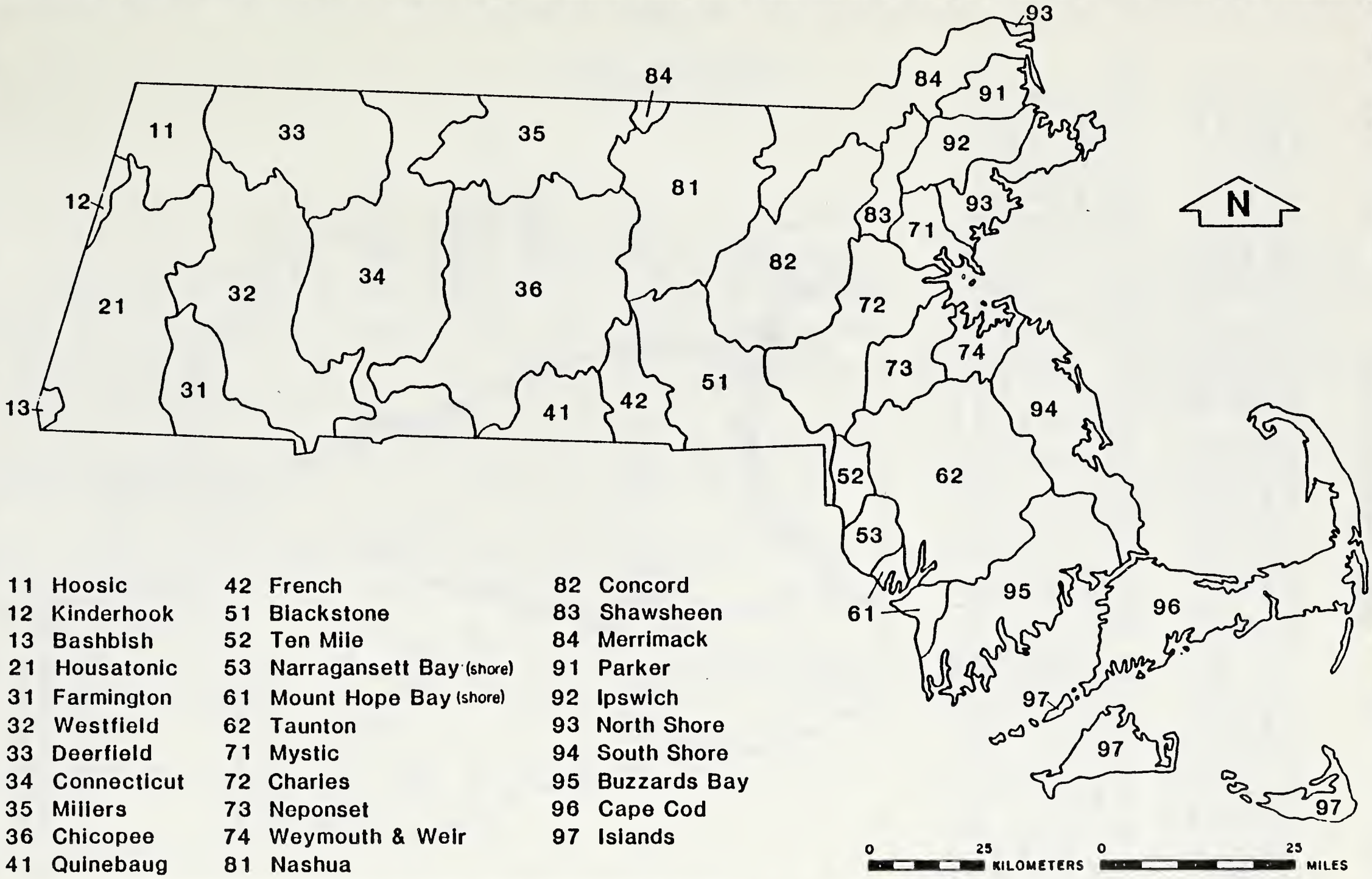
Lakes and Ponds (Continued)

LAKE/POND	AREA (ACRES)	LOCATION	DRAINAGE BASIN	STRATIFICATION	SEVERITY POINTS
White Island Pond	294	Plymouth/ Wareham	Buzzards Bay	U	7
Whitman's Pond	210	Weymouth	Weymouth & Weir	S	10
Whitney Pond	107	Winchendon	Millers	S	10
Wickaboag Pond	320	W. Brookfield	Chicopee	U	7
Willow Lake	4	Northampton	Connecticut	U	6
Willow Pond	1	Brookline	Charles	U	7
Windsor Pond	44	Windsor	Westfield	S	8
Winning Pond	23	Billerica	Concord	U	9
Winnecunnet Pond	148	Norton	Taunton	U	8
Winnekeag Lake	118	Ashburnham	Nashua	S	10
Lake Winthrop	150	Holliston	Charles	S	9
Woods Pond	122	Lenox	Housatonic	U	17
Wyman Pond	200	Westminster	Nashua	S	12
Lake Wyola	129	Shutesbury	Connecticut	S	9
Yokum Pond	109	Becket	Westfield	U	3

Appendix III

River/Harbor Segment

Water Quality Information



11	Hoosic	42	French	82	Concord
12	Kinderhook	51	Blackstone	83	Shawsheen
13	Bashbish	52	Ten Mile	84	Merrimack
21	Housatonic	53	Narragansett Bay (shore)	91	Parker
31	Farmington	61	Mount Hope Bay (shore)	92	Ipswich
32	Westfield	62	Taunton	93	North Shore
33	Deerfield	71	Mystic	94	South Shore
34	Connecticut	72	Charles	95	Buzzards Bay
35	Millers	73	Neponset	96	Cape Cod
36	Chicopee	74	Weymouth & Weir	97	Islands
41	Quinebaug	81	Nashua		

DEQE·DWPC·Technical Services Branch

Figure 2

COMMONWEALTH OF MASSACHUSETTS
RIVER BASINS and COASTAL DRAINAGE AREAS

HOOSIC RIVER BASIN (11)

The Hoosic River rises in the northwestern corner of Massachusetts and travels through Vermont and parts of New York, where it joins the Hudson River just above Albany. The total watershed area is 713 square miles of which 165 square miles are in Massachusetts. In Massachusetts the river is made up of the mainstem, South Branch, North Branch, Green River and many smaller tributaries.

The North Branch begins in Reedsborough, Vermont and flows southerly through Stanford, Vermont into Clarksburg, Massachusetts. The river continues in a southwesterly direction until joining the South Branch in North Adams. The headwaters of the South Branch rise as far south as Pittsfield. The South Branch itself, however, begins at the outlet of Cheshire Reservoir, Cheshire and flows north through Adams to the confluence with the North Branch in North Adams. From the confluence the mainstem travels in a northwesterly direction through Williamstown to Pownal, Vermont.

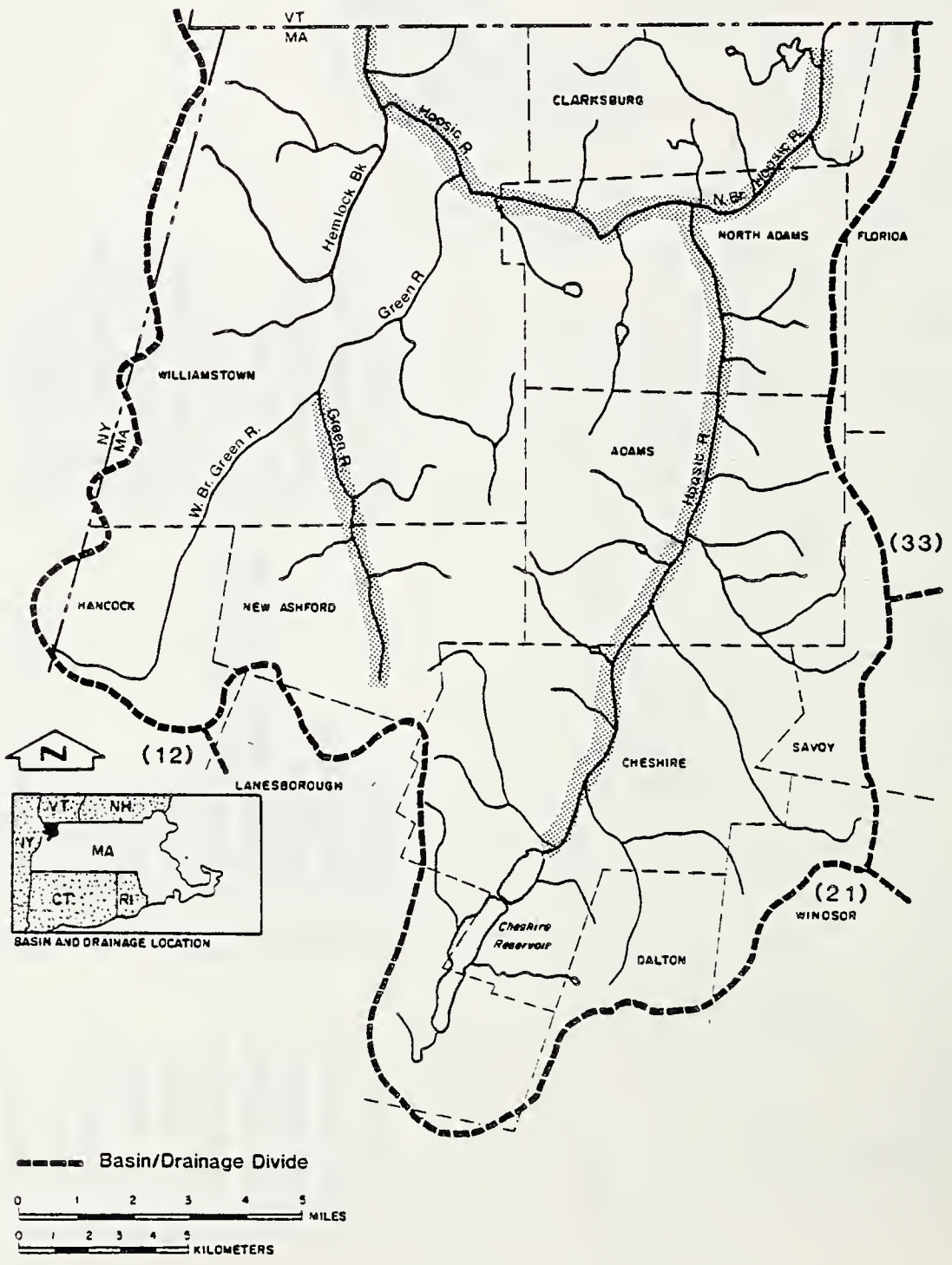


TABLE 8

HOOSIC RIVER BASIN
DRAINAGE AREA 11

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Hoosic River from outlet Cheshire Reservoir, Cheshire to Route 346 bridge, Pownal, VT	21.5-2.0	B	Yes	1977 1978 1982	Coliform bacteria Possible PCB Heavy metals	Adams WWTP. Industrial discharges.	Industrial pretreatment; improved solids handling facilities at Adams WWTP.
Green River from New Ashford to Green River Road, Williamstown	10.8-5.4	B	Yes	1977 1978 1982	Coliform bacteria	Failing septic systems.	Facilities plan for sewering area underway.
Green River from Green River Road to confluence with Hoosic River, Williamstown	5.4-0.0	B	No	1977 1978 1982	--	--	--
North Branch Hoosic River to Brown Street bridge, North Adams	4.9-0.0	B	Yes	1977 1978 1982	Coliform bacteria	Failing septic systems.	--
Tophet Brook (entire length)	1.1-0.0	B	No	1977	--	--	--
Hemlock Brook (entire length)	3.5-0.0	B	No	1978	--	--	--

Total miles assessed - 39.8
Total miles meeting standards - 10.0

HOUSATONIC RIVER BASIN (21)

The Housatonic River rises in western Massachusetts and travels south 131 miles through Massachusetts and Connecticut to Long Island Sound. The total watershed area is 1,950 square miles, of which approximately 500 square miles are in Massachusetts.

The Housatonic Basin in Massachusetts has a maximum east-west width of 19 miles and a maximum length in a north-south direction of 38 miles. The valley is bordered on the west by the Taconic Range and on the east by the Berkshire Hills. The valley is relatively steep and narrow at the headwaters of its branches, but broadens and flattens as it nears Connecticut.

The Housatonic River in Massachusetts consists of the main stem, East, West, and Southwest branches, and many major tributaries, including the Williams and Green Rivers.

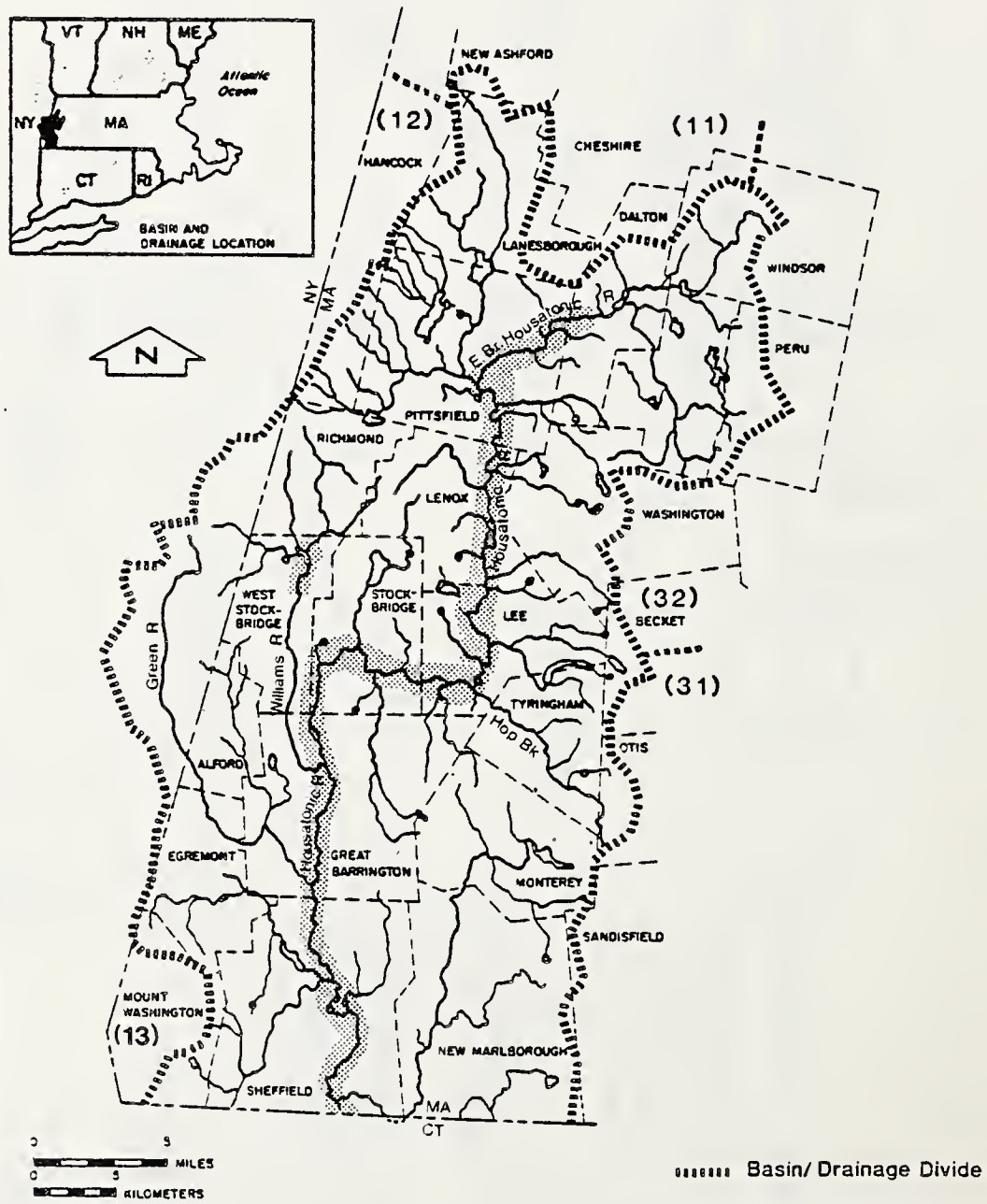


TABLE 9

HOUSATONIC RIVER BASIN
DRAINAGE AREA 21

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Housatonic River from Pittsfield to Connecticut boundary, Sheffield	55.4-0.0	B	Yes	1982 1981 1978	PCB	In-place sediment. Stockbridge WWTP.	Studies underway to determine best method of action. Facilities planning underway to upgrade Stockbridge WWTP.
East Branch from Hinsdale to Crane Paper Company, Pittsfield	13.6-5.1	B	No	1978	--	--	--
East Branch from Crane Paper Company to confluence with West Branch, Pittsfield	5.1-0.0	B	Yes	1977 1978 1981 1982	Dissolved oxygen	Unknown	--
West Branch from source to confluence with East Branch, Pittsfield	4.7-0.0	B	No	1978	--	--	--
Williams River from source to West Stockbridge	10.5-8.6	B	Yes	1978	Suspected coliform bacteria	Untreated sanitary discharges.	Facilities planning underway for West Stockbridge.
Williams River from West Stockbridge to the confluence with the Housatonic River, Great Barrington	8.6-0.0	B	No	1978	None	--	--

Total miles assessed - 84.2
Total miles meeting standards - 21.8

FARMINGTON RIVER BASIN (31)

The Farmington River Basin covers a total area of 602 square miles. Approximately 149 square miles of this area are in southwestern Massachusetts. The Farmington River is a tributary of the Connecticut River; the confluence is located near Hartford in Windsor, Connecticut.

The major portion of this area in Massachusetts drains into the West Branch of the Farmington River and its tributaries. The remaining portion drains into Pond and Valley Brooks, which form the East Branch of the Farmington River just below the state line in Connecticut. Throughout the entire basin, the terrain is hilly with large, relatively level areas occuring on the hilltops at about 1,200 feet above mean sea level. There are also numerous small mountain streams.

The headwaters of the Clam River are formed by many small streams located in uninhabited mountain wilderness. The Clam River is joined by the Buck River about two miles above its confluence with the West Branch of the Farmington River. The river is very rapid and has an average fall of about 100 feet per mile.

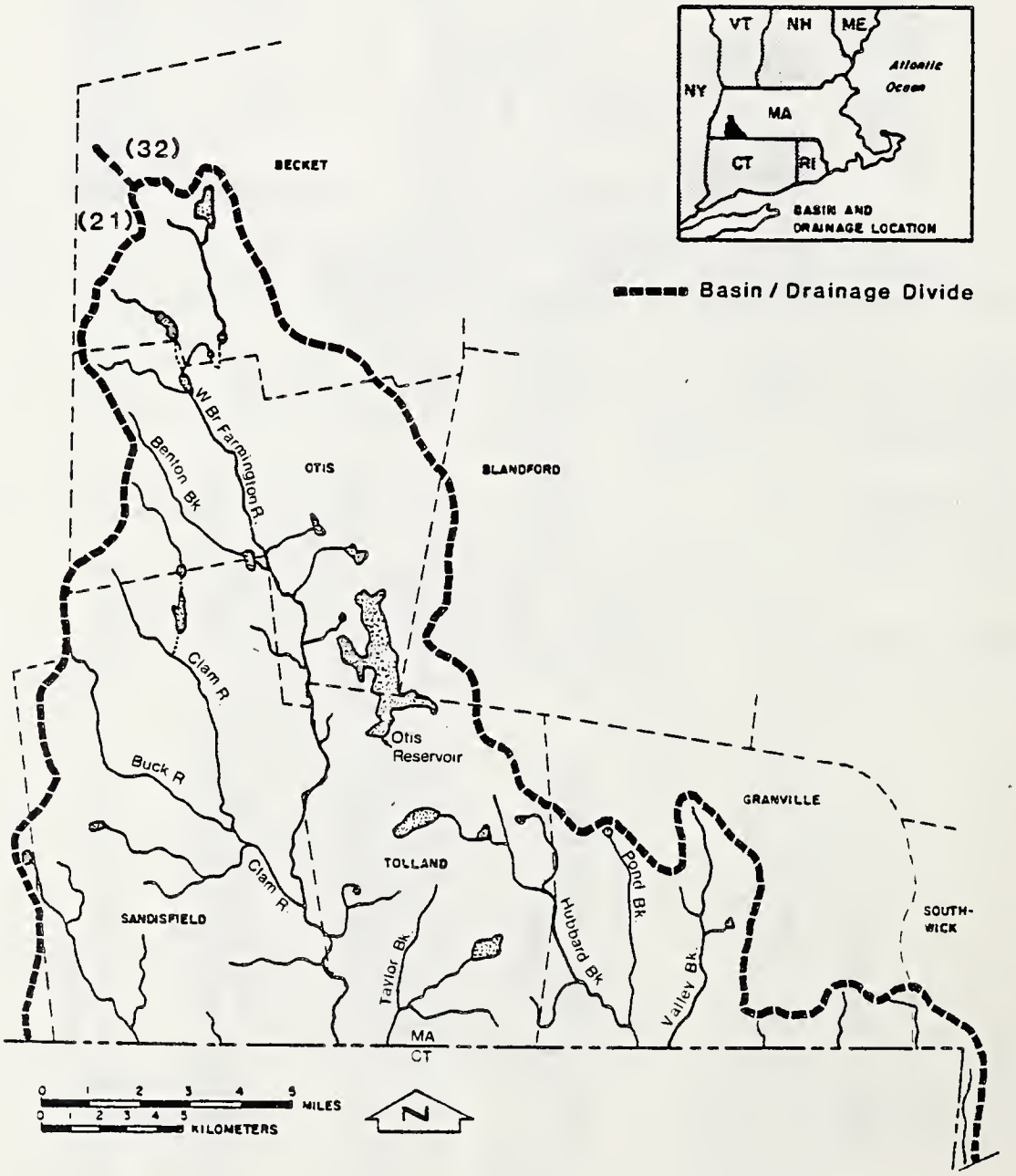


TABLE 10

FARMINGTON RIVER BASIN
DRAINAGE AREA 31

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
West Branch from Becket to 1,000 feet from Connecticut state line, Sandisfield-Tolland	14.6-0.1	B	No	1974	--	--	--
West Branch 1,000 feet from state line to state line, Sandisfield-Tolland	0.1-0.0	A	No	None	--	--	--
Fall River from source to confluence with West Branch, Otis	1.0-0.0	B	No	1974	--	--	--
Clam River from source in Otis to confluence with West Branch, Sandisfield	10.0-0.0	B	No	1974	--	--	--

Total miles assessed - 25.6
Total miles meeting standards - 25.6

WESTFIELD RIVER BASIN (32)

The Westfield River basin covers 517 square miles of west-central Massachusetts and includes portions of Franklin, Hampshire, Hampden, and Berkshire counties. The Westfield River begins in Savoy, dropping 1,000 feet in the first 14 miles, the river swiftly makes its way to Huntington where it is joined by the middle and west branches.

The Middle Branch of the Westfield River begins in the town of Peru and flows 18 miles to join the main branch 27 miles above its mouth. Falling 1,250 feet along its course, the Middle Branch has a drainage area of 52.6 square miles and an average flow of 102 cfs at the United States Geological Survey gage just above its confluence with the main branch.

The West Branch of the Westfield River flows 17.5 miles through Becket, Middlefield and Chester, falling 840 feet before joining the Main Branch in Huntington 25 miles above its mouth. At the United States Geological Survey gage 1.5 miles upstream of its confluence, the West Branch has an average flow of 182 cfs and drains an area of 93.7 square miles.

The Little River is often referred to as the Westfield Little River because of another tributary stream in Huntington with the same name. The river flows 13 miles through Russell and Westfield to join the Westfield River 11 miles above its mouth.

TABLE 11

WESTFIELD RIVER BASIN
DRAINAGE AREA 32

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
West Branch							
Source in Becket to confluence with Walker Brook, Chester	17.5-7.3	B	No	1965 1978	None	None	None
Confluence with Walker Brook, Chester to confluence with main stem Westfield River, Huntington	7.3-0.0	B	Yes	1965 1978	Coliform bacteria	Untreated domestic discharges. Combined sewer overflows in Chester.	Separation of sewage and stormwater collection systems.
Middle Branch							
Source in Peru to Littleville Dam, Huntington	18.1-1.0	A	No	1965	None	None	None
Littleville Dam to confluence with main stem Westfield River, Huntington	1.0-0.0	B	No	1965 1978	None	None	None
Main Stem Westfield River							
Source in Savoy, to confluence with West Branch, Huntington	62.5-25.1	B	No	1965 1978	Coliform bacteria	Isolated domestic discharges. Stormwater runoff.	Tie-in remaining discharges to the Huntington WWTP.

TABLE 11 (Continued)

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Confluence with West Branch to confluence with Connecticut River, West Springfield-Agawam	25.1-0.0	B	Yes	1965 1972 1974 1978 1979	Occasional coliform bacteria pH	Stormwater runoff. Isolated domestic discharges. Acid rain.	Sewer extentions and rehabilitation of the Russell WWTP. Stormwater management.
Westfield Little River from Cobble Mountain Reservoir in Blandford to Broad Street bridge, Westfield	4.7-2.0	B	No	1965 1972 1974 1978 1979	None	Agricultural runoff.	Stormwater runoff management.
Broad Street bridge, Westfield to confluence with Westfield River, Westfield	2.0-0.0	B	Yes	1965 1972 1974 1978 1979	Occasional coliform bacteria	Urban runoff.	Stormwater runoff management.
Powdermill Brook from confluence with Arm Brook to confluence with Westfield River, Westfield	3.2-0.0	B	No	1978	None	Stormwater runoff.	Stormwater runoff management.

Total miles assessed - 106.0
Total miles meeting standards - 71.6

DEERFIELD RIVER BASIN (33)

The Deerfield River represents a classic example of a formerly "wild river" which has been tamed by man. For most of its course in Massachusetts the Deerfield once ran through deep valleys on a steep gradient. The gradient was less and the velocity slowed down some in the last few miles as the Deerfield flowed across the flood plain of the Connecticut River, but even here the Deerfield still was shallow and flowed rapidly to its confluence with the Connecticut River. Now the flow of the Deerfield is continually interrupted by power dams located along its course in Massachusetts and Vermont.

The headwaters of the Deerfield are in Vermont. After flowing through a series of reservoirs constructed by the electric utility companies, the Deerfield first enters Massachusetts as the discharge from Sherman Reservoir. For most of its length in Massachusetts, the river is alternately impounded behind electric utility dams, or flows on a steep gradient through sparsely populated valleys until it reaches the next downstream impoundment. Major tributaries to the Deerfield in Massachusetts are the North River and the Green River. After flowing for 44 miles through Massachusetts, the Deerfield joins the Connecticut River at the Greenfield-Deerfield town line.

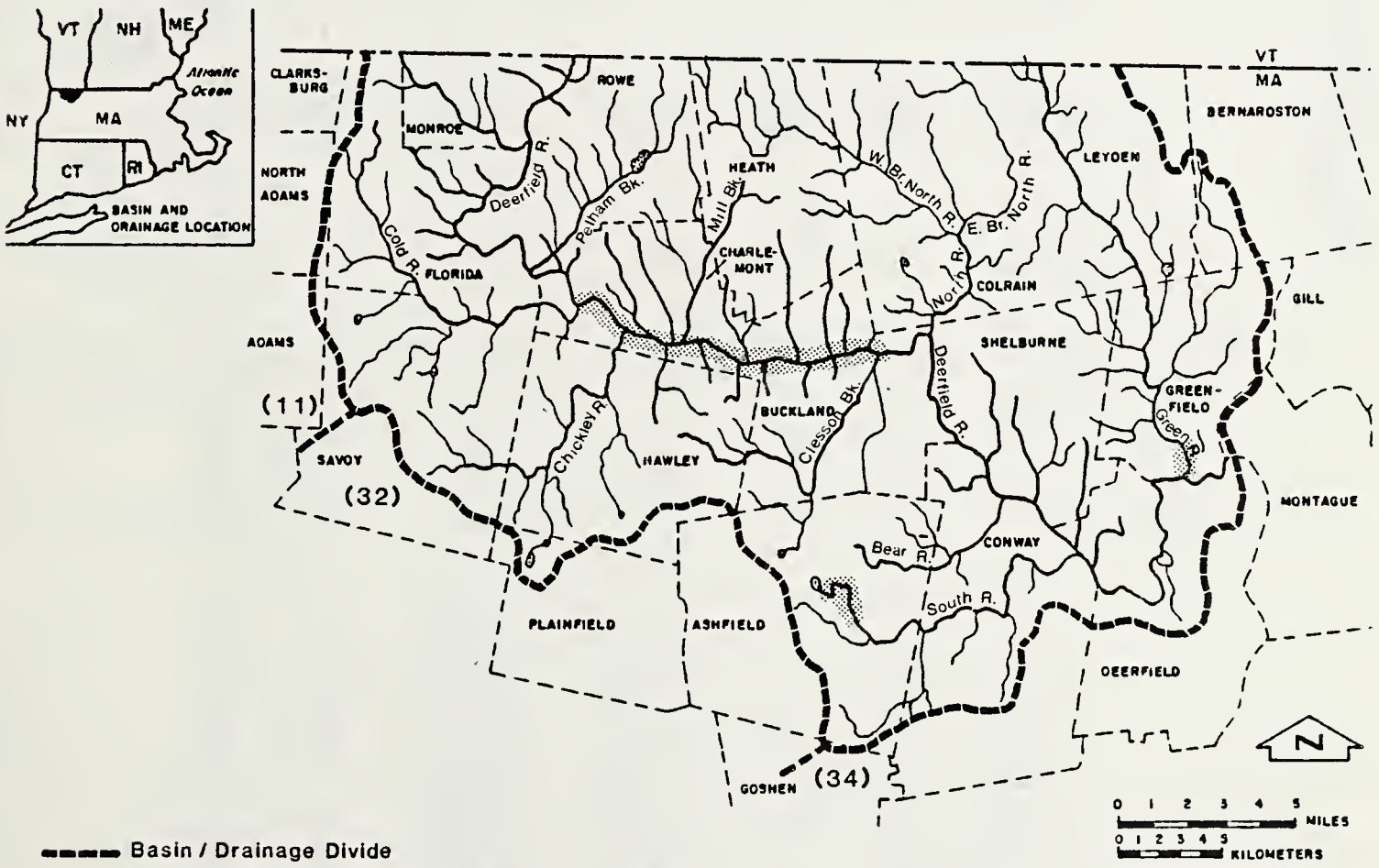


TABLE 12

DEERFIELD RIVER BASIN
DRAINAGE AREA 33

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Deerfield River							
Vermont Line to Cold River, Charlemont	42.4-29.6	B	No	1977 1983	--	--	--
Cold River to Dam 4, Charlemont	29.6-19.7	B	Yes	1977 1983	Coliform bacteria	Untreated discharges in Charlemont.	Construction of a treatment system for the center of Charlemont.
Dam 4, Charlemont to Connecticut River, Greenfield-Deerfield	19.7-0.0	B	No	1977 1983	--	--	--
North River							
Vermont line to Deerfield River, Charlemont-Shelburne	9.5-0.0	B	No	1977 1983	--	--	--
Green River							
Vermont line to Greenfield STP, Greenfield	14.0-0.5	B	No	1977 1983	--	--	--
Greenfield STP to Deerfield River, Greenfield	0.5-0.0	B	Yes	1977 1983	Nutrients Chlorine residual Solids	Greenfield STP.	Pipe Greenfield STP directly to Deerfield River.
South River							
Outlet Ashfield Pond to Emmets Road, Ashfield	13.3-11.4	B	Yes	1977 1983	Coliform bacteria Nutrients	Untreated discharges from the town of Ashfield.	Treatment must be provided for Ashfield Center discharges.

TABLE 12 (CONTINUED)

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Emmets Road, Ashfield to Deerfield River, Conway	11.4-0.0	B	No	1977 1983	--	--	--

Total miles assessed - 79.2
Total miles meeting standards - 66.9

CONNECTICUT RIVER BASIN (34)

The Connecticut River begins in Canada and for most of its course north of Massachusetts serves as the boundary between New Hampshire and Vermont. The river flows essentially due south through Massachusetts from Bernardston and Northfield on the Vermont-New Hampshire line to Agawam and Longmeadow on the Connecticut state line. From here the Connecticut flows south through the State of Connecticut to Long Island Sound. In Massachusetts the Connecticut River Basin is bounded by the Housatonic and Hoosic drainage basins on the west, and by the French and Quinebaug and the Nashua drainage basins on the east. There are approximately 66 river miles in Massachusetts. The Connecticut River main stem has a drainage area of 650 square miles in Massachusetts. This area had a 1970 population of 500,000 people. Most of these are located in the metropolitan Springfield area. The four major tributaries to the Connecticut River in Massachusetts are the Millers, Deerfield, Chicopee, and Westfield Rivers. Each of these is dealt with separately in this report. When these four tributaries are added to the Conneticut River main stem, the drainage area in Massachusetts is 2,949 square miles and the population is more than 650,000 people. The Conneticut River is the largest river in New England. The average flow at the Massachusetts-Connecticut state line is 16,180 cfs.

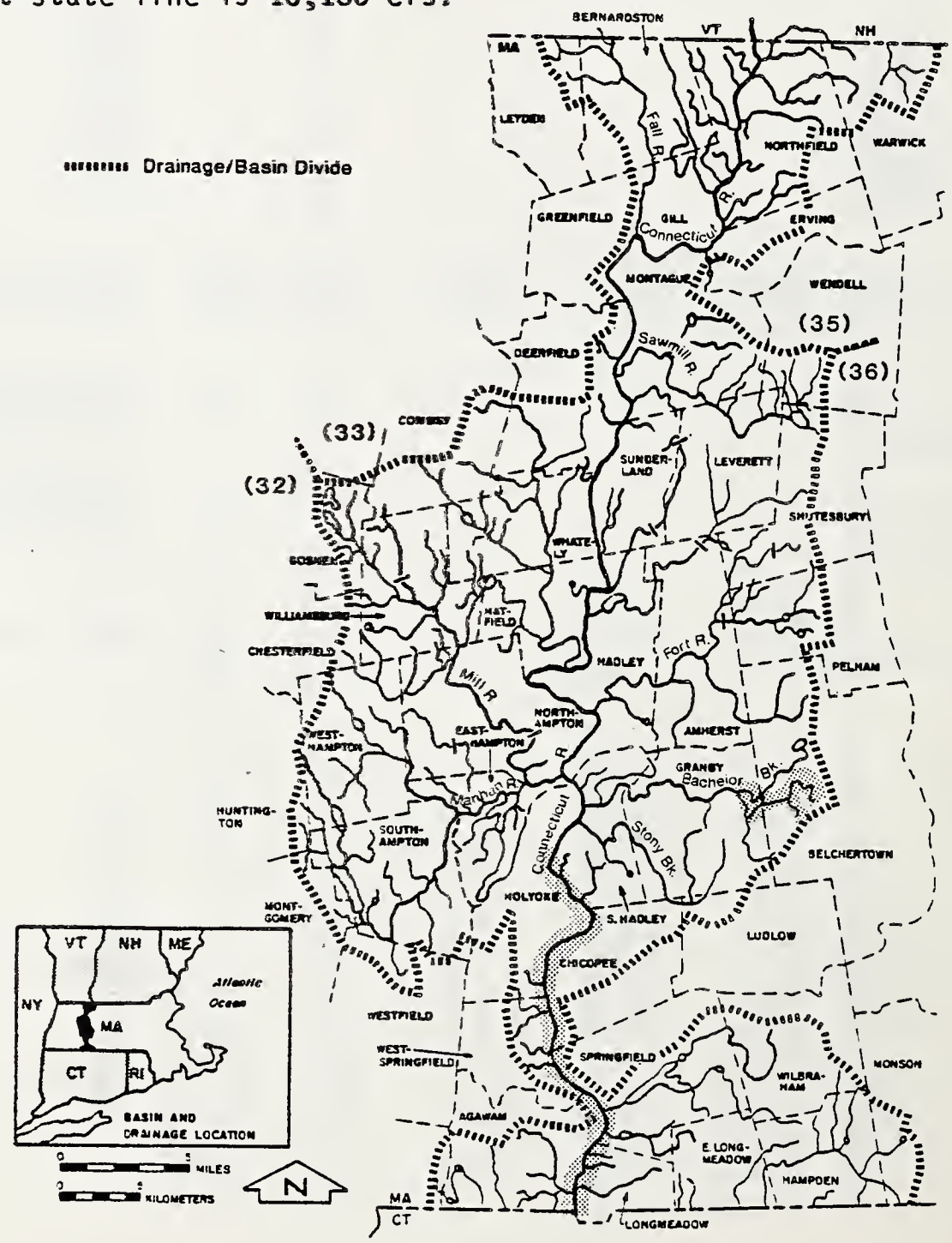


TABLE 13

CONNECTICUT RIVER BASIN
DRAINAGE AREA 34

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Connecticut River from VT - NH line to Holyoke Dam, Holyoke-South Hadley	138.2-86.6	B	No	1978 1982 1983	Occasional coliform	CSO's, some untreated discharges.	--
Connecticut River from Holyoke Dam to CT line, Longmeadow/Agawam	86.6-70.7	B	Yes	1978 1980 1982 1983	Coliform bacteria Nutrients	CSO's.	Control CSO's
Forge Pond, Weston Brook, Lampson Brook, Belchertown-Granby	12.4-9.1	B	Yes	1978 1980 1983	Nutrients, Dissolved oxygen	Belchertown STP discharge.	I/A treatment for the Belchertown discharge.
Bachelor Brook from the outlet of Forge Pond in Granby to the Connecticut River, South Hadley	9.1-0.0	B	No	1978 1980 1983	--	--	--

Total miles assessed - 79.9
Total miles meeting standards - 60.7

MILLERS RIVER BASIN (35)

The Millers River is formed in Winchendon by the confluence of the North and South Branches. The North Branch begins in New Ipswich, New Hampshire, while the South Branch begins in Ashburnham, Massachusetts. The main stem of the Millers River flows generally westward through Winchendon, Templeton, Royalston, Athol, Orange, Erving, and Montague, joining the Connecticut River just below the French King Bridge in Gill.

Major tributaries are the Otter River which enters in Winchendon, and the Tully River which enters in Athol. The Tully and Millers Rivers are considered as potential sources of water supply.

The Millers River drains a total area of 390 square miles, of which about 350 are in Massachusetts. Average flow entering the Connecticut River from the Millers is 620 cubic feet-per-second.

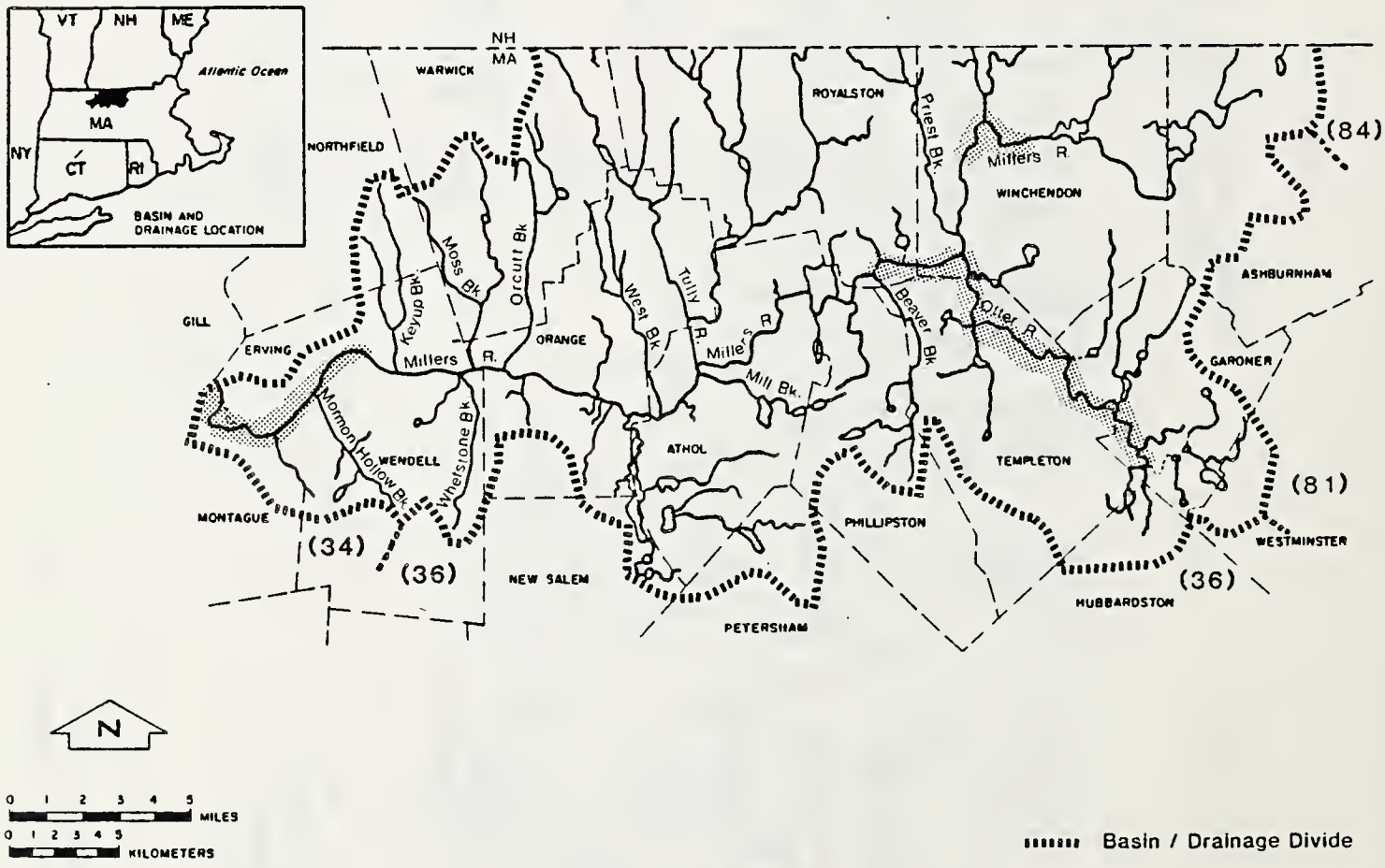


TABLE 14

MILLERS RIVER BASIN
DRAINAGE AREA 35

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Millers River							
Above Winchendon STP, Winchendon	above 35.7	B	Yes	1979	Coliform bacteria	Winchendon CSO's.	Eliminate Winchendon CSO's.
Winchendon STP to Otter River, South Royalston	35.7-30.4	B	No	1979 1980 1981 1982	--	--	--
Otter River to South Royalston USGS Gage, South Royalston	30.4-25.6	B	Yes	1979 1980 1981 1982	Dissolved oxygen Nutrients	Gardner WWTP.	Advanced waste treatment at Gardner.
South Royalston USGS Gage to Erving Paper Company, Erving	25.6-8.1	B	No	1979	--	--	--
Erving Paper Company to Connecticut River, Erving	8.1-0.0	B	Yes	1979 1980 1981	Solids	Erving WWTP.	Eliminate operational problems at Erving WWTP.
Otter River							
From source in Gardner to confluence with Millers River, Winchendon	9.7-0.0	B	Yes	1979 1980 1981 1982	Dissolved oxygen Nutrients	Natural condition in Gardner. Gardner at WWTP.	AWT at Gardner WWTP. Biological treatment at Seaman Paper Co.

TABLE 14 (CONTINUED)

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Beaver Brook							
Fernald State School discharge in Templeton to Millers River, Royalston	3.1-0.0	B	No	1979	--	--	--

Total miles assessed - 48.5
Total miles meeting standards - 25.9

CHICOPEE RIVER BASIN (36)

The Chicopee River Basin covers an area of over 720 square miles in central Massachusetts. All or part of 32 towns lie within the basin, with the majority of the population concentrated in the Springfield Massachusetts Area. Generally the remaining area typifies the image of rural New England countryside with rolling hills, woodlands, small ponds, and winding brooks.

The basin includes four major adjoining river systems -- the Ware River (219 mi^2), the Swift River (216 mi^2) which includes Quabbin Reservoir, the Quaboag River (210 mi^2), and the Chicopee River - which together contribute an average flow of about 1,925 cubic feet per second to the Connecticut River.

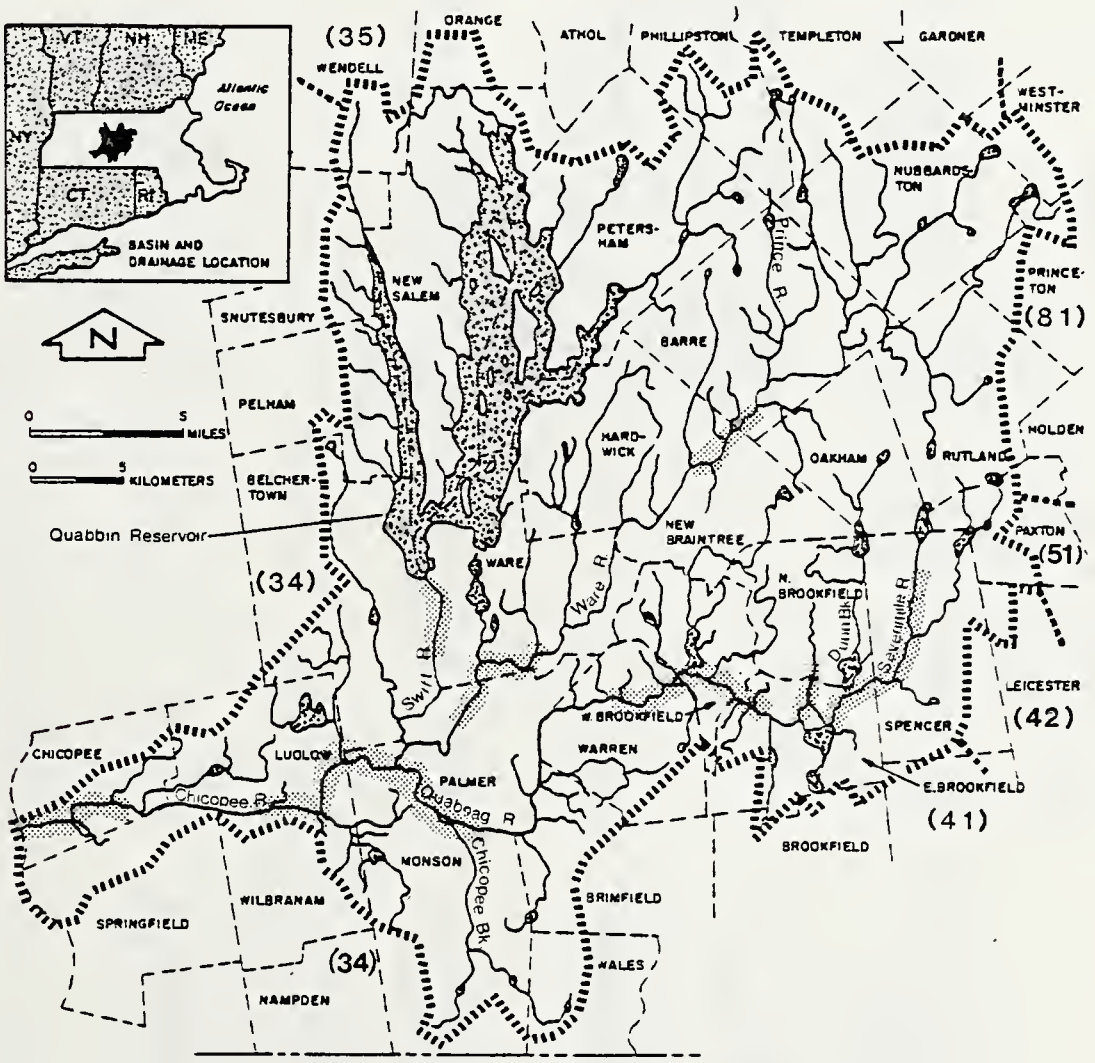


TABLE 15

CHICOPEE RIVER BASIN
DRAINAGE AREA 36

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Chicopee River							
Source in Palmer to Wilbraham WWTP, Wilbraham	17.9-11.7	B	Yes	1972 1974 1980	Coliform bacteria	Urban and agricultural runoff.	Land management techniques, and sewer flushing.
Wilbraham WWTP to Chicopee Falls, Chicopee	11.7-3.0	B	No	1972 1974 1980	Occasional coliform bacteria	Urban runoff, carryover from upstream.	Combined sewer overflow elimination or treatment.
Chicopee Falls to confluence with Connecticut River, Chicopee	3.0-0.0	B	Yes	1972 1974 1980	Dissolved oxygen Coliform bacteria	Combined sewer overflows, urban runoff, carryover from upstream.	Combined sewer overflow elimination or treatment.
Ware River Basin							
East Branch Ware River from Rutland to Barre Falls Dam, Barre	4.8-0.0	A	No	1974	None	None	None
West Branch Ware River and Ware River above MDC intake, Barre	46.0-29.1	A	No	1972 1974 1980	None	None	None
MDC intake to South Barre	29.1-27.3	B	No	1972 1979 1980	None	None	None

TABLE 15 (CONTINUED)

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Ware River Basin (continued)							
South Barre to Wheelwright Dam, Hardwick-New Braintree	27.3-23.3	B	Yes	1972 1979	Coliform bacteria	Domestic discharges.	Secondary treatment facility currently under construction.
Wheelwright Dam to Ware Dam, Ware	23.3-12.2	B	No	1972 1974 1980	None	None	None
Ware Dam to Thorndike Dam, Palmer	12.2-3.3	B	Yes	1972 1974 1980 1981	Dissolved oxygen Total and suspended solids, color, coliform bacteria	Untreated and inadequately treated industrial and domestic discharges.	Upgrading of the Ware WWTP to provide secondary treatment and phosphorus removal. Reduction of agricultural and stormwater runoff.
Thorndike Dam to confluence with Quaboag River, Palmer	3.3-0.0	B	No	1972 1974 1980	Occasional coliform bacteria	Isolated domestic discharges.	Tie-in to existing wastewater collection system.
Prince River	8.4-0.0	B	No	1978	None	None	None
Swift River above Windsor Dam, Belchertown	above 9.8	A	No	1974	None	None	None
Windsor Dam to Bondsville	9.8-4.4	B	Yes	1974	Solids Nutrients	McLaughlin Fish Hatchery.	Solids removal from fish hatchery effluent.

TABLE 15 (CONTINUED)

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Bondsville to confluence with Ware River, Palmer	4.4-0.0	B	No	1974 1980	Occasional coliform bacteria	Isolated domestic discharges.	None
Quaboag River Basin							
Sevenmile River from source to Smithville Road, Spencer	8.6-4.0	B	No	1974 1982	None	Natural conditions.	None
Smithville Road to confluence with East Brookfield River, East Brookfield	4.0-0.0	B	Yes	1972 1974 1977 1979 1982	Dissolved oxygen Ammonia Phosphorus	Spencer WWTP. Natural conditions.	Upgrade Spencer WWTP to provide nutrient removal.
East Brookfield River, source to Quaboag Pond, East Brookfield	2.2-0.0	B	Yes	1972 1974 1977 1979 1982	Dissolved oxygen Ammonia Phosphorus	Spencer WWTP. Natural conditions.	Upgrade Spencer WWTP to provide nutrient removal.
Quaboag River Basin (continued)							
Quaboag River from Brookfield to Route 67 bridge, West Brookfield	24.9-19.2	B	Yes	1972 1974 1977 1979 1983	Dissolved oxygen	Natural conditions.	None

TABLE 15 (CONTINUED)

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Route 67 bridge to Route 32 bridge, Palmer-Monson	19.2-5.1	B	No	1972 1974 1979 1980 1983	Occasional coliform bacteria	Agricultural runoff.	None
Route 32 bridge to confluence with Ware River, Palmer	5.1-0.0	B	Yes	1972 1974 1980	Coliform bacteria	Isolated domestic discharges, stormwater runoff.	Tie-in existing wastewater collection system.
Dunn Brook above North Brookfield WWTP, Brookfield	4.9-3.3	B	No	1977 1979	None	None	None
North Brookfield WWTP to confluence with Quaboag River, Brookfield	3.3-0.0	B	Yes	1977 1979	Dissolved oxygen Ammonia Phosphorus Coliform bacteria	North Brookfield WWTP.	Upgrade North Brookfield WWTP to secondary treatment or land application of effluent.
Chicopee Brook, source to confluence with Quaboag River, Monson	7.0-0.0	B	No	1972 1974 1980	None	None	None

Total miles assessed - 134.5
Total miles meeting standards - 86.7

QUINEBAUG RIVER BASIN (41)

The Quinebaug River begins in Union, Connecticut and flows northwest to Hamilton Reservoir, which lies on the Connecticut-Massachusetts state line. Leaving the reservoir, the river then flows north through Holland and Brimfield in Massachusetts and turns east to Sturbridge, where it passes through Old Sturbridge Village. Upon leaving Sturbridge, the river turns southeast to Southbridge, where it is joined by Cady Brook, and on through Dudley to recross the state line at Thompson, Connecticut. The Quinebaug River is then joined by the French River in Thompson and continues south to Norwich where it is joined by the Shetucket River; this confluence forms the Thames River, which continues south to Long Island South at New London, Connecticut. Of the Quinebaug River's 76 miles, 28 lie in Massachusetts and drain an area of 148 square miles. Municipal wastewater treatment plants in Sturbridge and Southbridge contribute to the flow in the Quinebaug River along with industrial discharges from the American Optical Company in Southbridge. Additional treated effluent is discharged to Cady Brook in Charlton by the town's wastewater treatment facility.

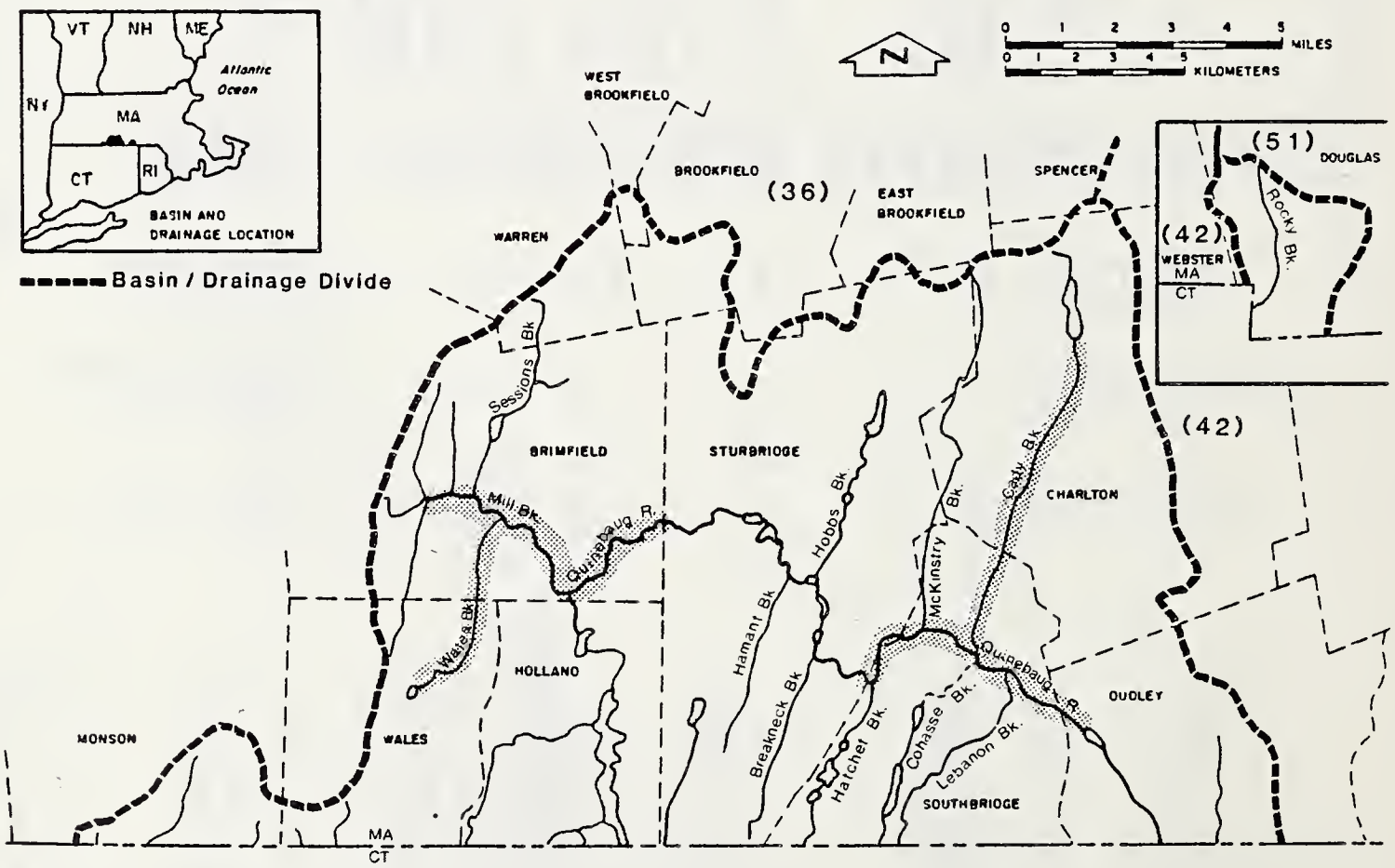


TABLE 16

QUINEBAUG RIVER BASIN
DRAINAGE AREA 41

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Quinebaug River above Sturbridge WWTP, Sturbridge	30.7-9.1	B	No	1976	--	--	--
Quinebaug River from Sturbridge WWTP to outlet of West Dudley Impoundment, Dudley	9.1-7.1	B	Yes	1972 1974 1976 1980	Coliform bacteria Phosphorus Solids	Sturbridge WWTP. Southbridge WWTP.	Expansion of Sturbridge WWTP. AST at Southbridge WWTP.
Quinebaug River from West Dudley Impoundment to Massachusetts-Connecticut line	10.2-7.9	B	No	1980	--	--	--
Cady Brook (entire length)	6.1-0.0	B	Yes	1972 1974 1976	Coliform bacteria Dissolved oxygen Solids Phosphorus	Failing septic systems. Charlton City WWTP.	Charlton facilities plan to evaluate sewer needs. AST at Charlton City WWTP.
Mill Brook (entire length)	4.3-0.0	B	Yes	1976	Coliform bacteria	Failing septic systems.	--
Wales Brook (entire length)	4.9-0.0	B	Yes	1976	Coliform bacteria	Failing septic systems.	--

Total miles assessed - 38.1
Total miles meeting standards - 20.8

FRENCH RIVER BASIN (42)

The French River is a major tributary of the Quinebaug River and extends 26 miles from its source in Greenville Pond, Leicester, to the confluence with Quinebaug River in Thompson, Connecticut. From its headwaters at Sargent Pond, Leicester (this portion, known as Town Meadow Brook, extends from Sargent Pond to Greenville Pond), the French River flows generally south throughout its length through Oxford, Dudley, and Webster to Thompson, Connecticut. Probably the best known feature along the French River is Lake Chargoggagoggmanchaugagoggchaubunagungamaugg (also known as Webster Lake) which not only has the longest name but is also one of the largest natural lakes in the state. The lake then drains to the French River via Mill Brook in Webster. Other tributaries discharging to the French River are generally small and include Burncoat, Bartons and Grindstone Brooks in Leicester; the Little River in Oxford; Potash Brook in Webster; and Backwater and Sunset Hill Brooks in Thompson. The Leicester, Oxford-Rochdale, Dudley, and Webster wastewater treatment plants discharge their effluents to the French River along with industrial discharges from Worcester Tool & Stamping in Leicester and non-contact cooling water from the Gordon Chemical Company.

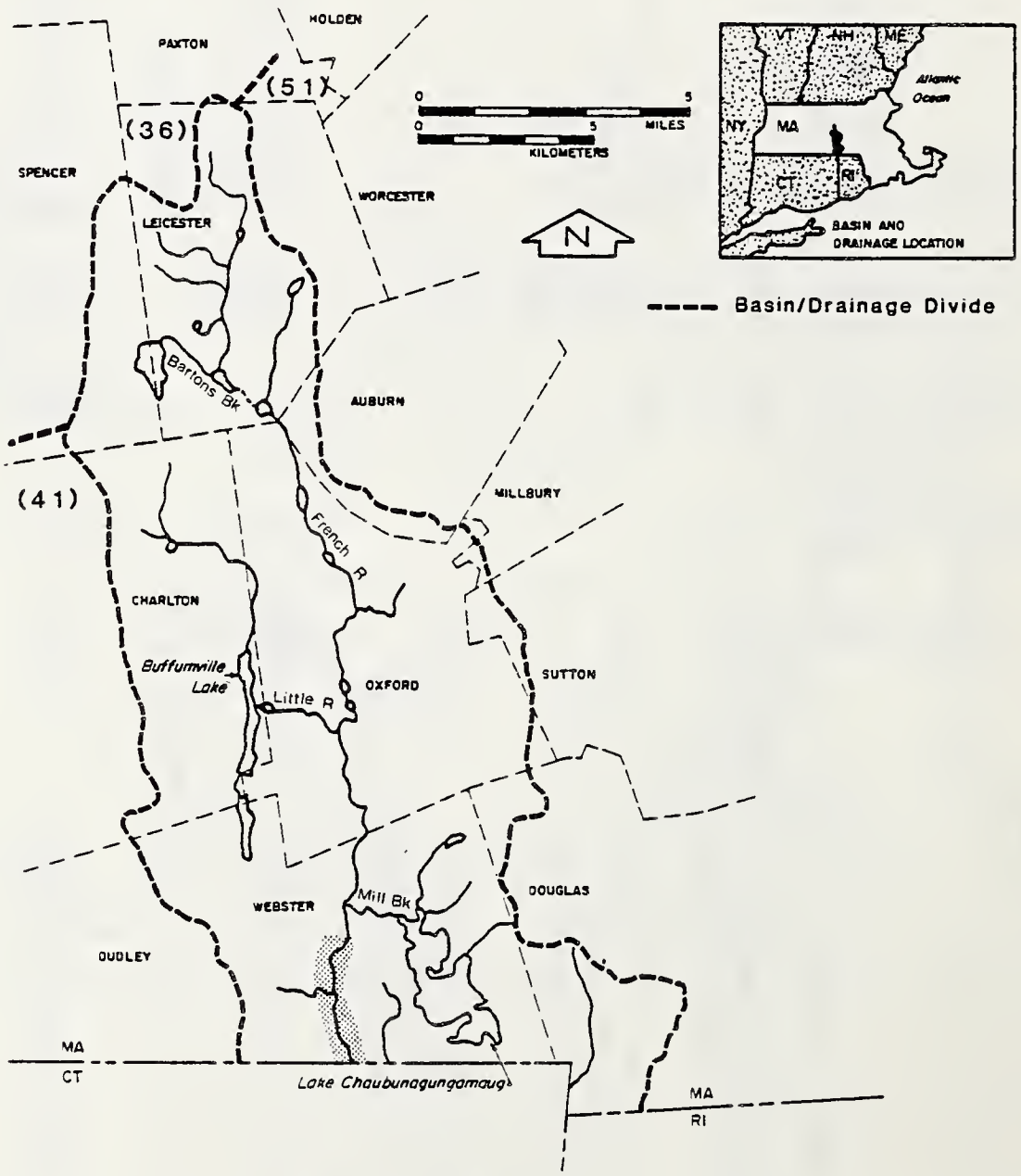


TABLE 17

FRENCH RIVER BASIN
DRAINAGE AREA 42

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
French River above Leicester WWTP, Leicester	27.7-27.3	B	No	1972 1974 1976 1982	--	--	--
French River from Leicester WWTP to Massachusetts-Connecticut state line, Webster	27.3-7.0	B	Yes	1972 1974 1976 1982	Coliform bacteria Solids Phosphorus	Leicester WWTP. Oxford-Rochdale WWTP. Webster WWTP. Dudley WWTP.	Advanced secondary treatment at the Leicester Center Water Supply District. Excessive infiltration and inflow at the Oxford-Rochdale WWTP should be eliminated to prevent hydraulic overloading. Regional advanced secondary treatment facility in Webster. Low flow augmentation. Removal or inactivation of oxygen demanding sludge deposits in downstream impoundments.
Burncoat Brook, Leicester	1.2-0.0	B	No	1976 1982	--	--	--

TABLE 17 (CONTINUED)

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Bartons Brook, Leicester	1.2-0.0	B	No	1976 1982	--	--	--
Little River, Charlton and Oxford	9.1-0.0	B	No	1976 1982	--	--	--

Total miles assessed - 32.2
Total miles meeting standards - 11.9

BLACKSTONE RIVER BASIN (51)

The Blackstone River is an interstate stream originating at Worcester's Kettle Brook Reservoir system located in Paxton. Flowing in a general easterly direction, Kettle Brook is joined by Beaver Brook to form the Middle River. Middle River in turn becomes the Blackstone River at the confluence with Mill Brook in Worcester. At this point the river turns to the south-southeast and flows another 29 miles, where it enters Rhode Island. The Blackstone drainage basin covers a total area of 540 square miles. Approximately 328 square miles are located in Massachusetts and drains to streams above tidal water. Major sub-watersheds within the Massachusetts portion are the Quinsigamond (37 mi^2), the West (27.9 mi^2), the Mumford (58 mi^2), and the Mill (35 mi^2).

From the headwaters to the state line, a distance of 44.7 miles the river drops 1,010 feet. Over half of this drop occurs in the first 10 miles, and much of the rest of it is taken up by the many dams along the river. The United States Geological Survey (U.S.G.S.) maintains a flow gage on the Blackstone River in Woonsocket, Rhode Island just below the state line. The average discharge at this gage over 51 years of record is 758 cubic feet per second (cfs) and the seven-day, ten-year low flow is approximately 90 cfs.

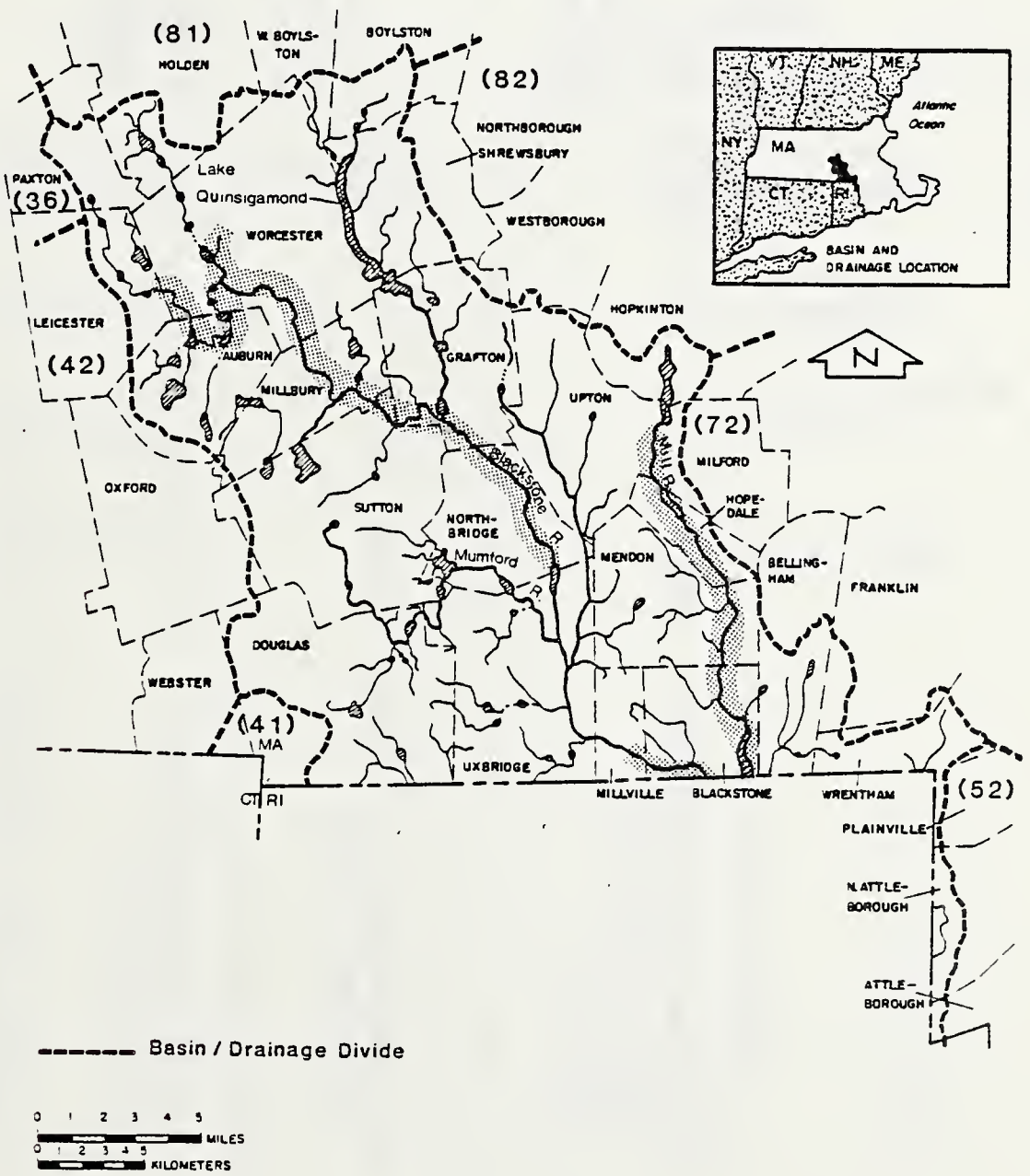


TABLE 18

BLACKSTONE RIVER BASIN
DRAINAGE AREA 51

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Blackstone River from Waite Pond, Leicester to American Steel Dam, Worcester	59.3-48.8	B	Yes	1977 1980	Color Solids Coliform Nutrient	Worcester Spinning and Finishing. Cherry Valley sewer discharge. Urban runoff.	Sewer this area to the UBWPAD-WWTP. Leicester WWTP. Stormwater detention and chlorination project underway.
American Steel Dam to Fisherville Dam, Grafton	48.8-39.8	C	Yes	1977 1980	D.O. Solids Coliform Nutrients	Mill Brook. UBWPAD-WWTP. Millbury STP.	Upgrade UBWPAD to AST. Correct industrial user problems in Worcester and Millbury (minor).
Fisherville Dam to Rice City Pond, Uxbridge	39.8-31.1	B	Yes	1977	D.O. Nutrients Algae	UBWPAD-WWTP. Nitrification.	
Rice City Pond to USGS Water Quality Monitor, Millville	31.1-23.7	B	No	1977 1980	--	--	--
Water Quality Monitor to state line, Blackstone-Woonsocket, RI	23.7-20.0	B	Yes	1977 1980	Coliform Nutrients	Sanitary discharges in Blackstone.	Sewering of Blackstone to Woonsocket WWTP underway.
Quinsigamond River, entire length	5.3-0.0	B	No	1977 1980	--	--	--

TABLE 18 (CONTINUED)

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Mumford River, entire length	14.5-0.0	B	No	1977 1980 1982	--	--	--
West River, entire length	8.8-0.0	B	No	1977 1980	--	--	--
Mill River, entire length	11.0-0.0	B	Yes	1977	Coliform D.O. Solids Nutrients	Hopedale STP.	Upgrade to AWT.
Mill Brook, entire length	3.0-0.0	B	Yes	1977 1980	D.O. Solids Coliform pH Nutrients	Combined sewer overflows.	Separate combined sewers.
Tatnuck/Beaver Brooks, entire length	3.0-0.0	B	Yes	1977 1980	D.O. Solids Coliform pH Nutrients	Combined sewer overflows.	Separate combined sewers.

Total miles assessed - 84.9
Total miles meeting standards - 36.0

TEN MILE RIVER BASIN (52)

The Ten Mile River drains an area of 54 square miles in southeastern Massachusetts and eastern Rhode Island. Originating in Savage's Pond in Plainville, Massachusetts, the stream flows generally southwest through North Attleborough, Attleboro and Seekonk to Pawtucket and East Providence, Rhode Island where it turns northwest and empties into the Seekonk River. The total length of the river is 22 miles, of which 15 are in Massachusetts. The elevation of the riverbed drops from 230 feet above mean sea level at the source to ten feet at the mouth for an average fall of ten feet-per-mile. Flow is highly restricted, with various dams creating a total of 15 impoundments. These impoundments comprise almost half the length of the river. Most of the remaining length is enclosed in concrete or masonry retaining walls which severely affect natural processes.

There are two major tributaries to the Ten Mile, the Bungay and Sevenmile Rivers. The former begins in a wetland in North Attleborough and flows south approximately five miles, joining the Ten Mile just above Mechanics Pond in Attleboro. Drainage area of the Bungay River Basin is 7.8 square miles. The Sevenmile River drains an area of 12.7 square miles. Flowing south from a wetland just east of North Attleborough center to join the Ten Mile at the state line, its total length, as its name professes, is seven miles.

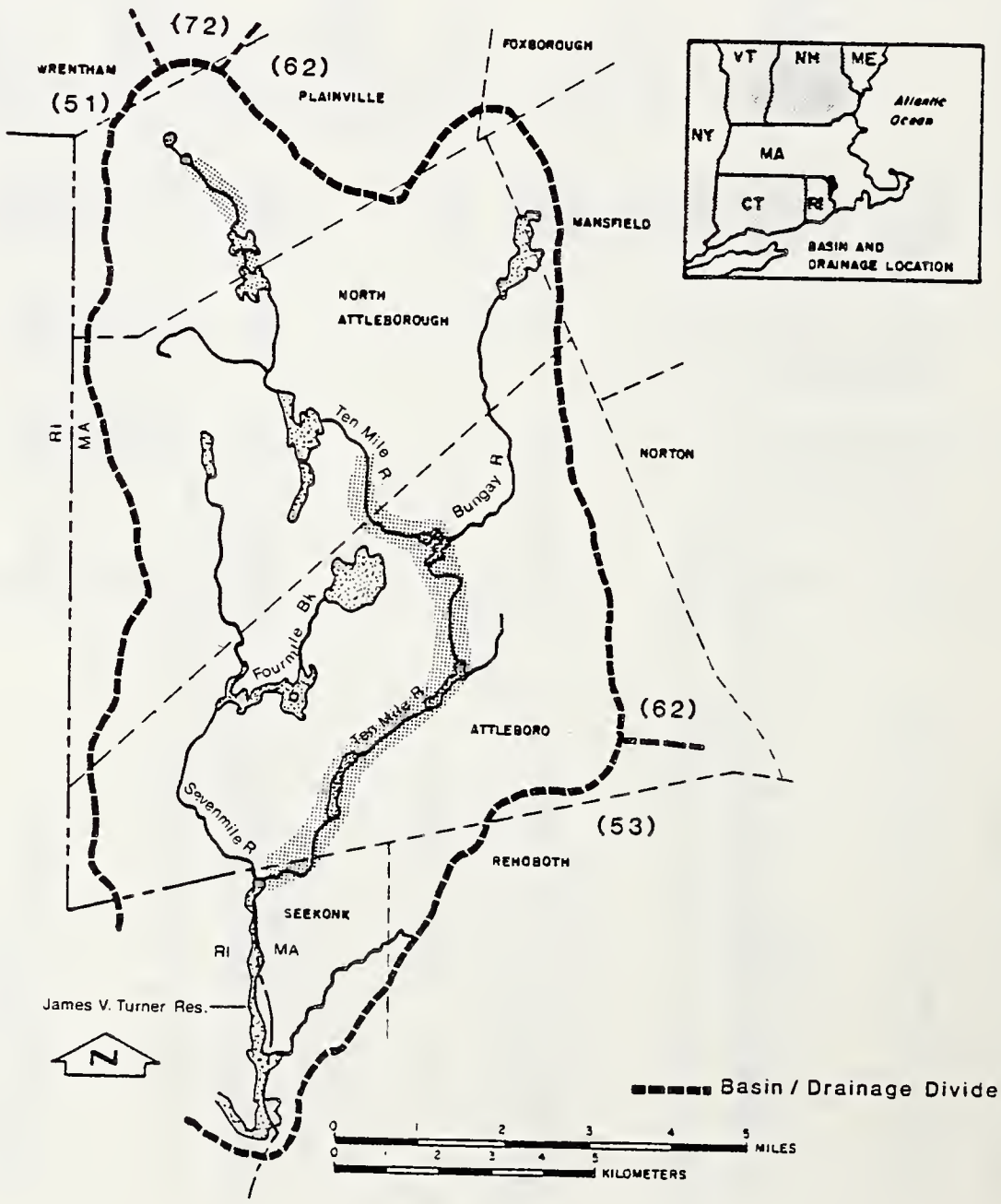


TABLE 19

TEN MILE RIVER BASIN
DRAINAGE AREA 52

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Headwaters in Plainville to the outlet of Whiting Pond, North Attleborough	22.6-18.8	B	Yes	1973 1979 1981	Dissolved oxygen	Algae.	Possible phosphorus limitations needed.
Outlet of Whiting Pond, to North Attleborough WWTP, North Attleborough	18.8-15.1	B	No	1973 1979 1981	Solids Color	Algae.	Possible phosphorus limitations needed.
North Attleborough WWTP effluent to the confluence with the Seekonk River, East Providence, RI	15.1-0.0	B	Yes	1973 1979 1981	Dissolved oxygen Coliform bacteria Eutrophication	Organic loads. Untreated discharges. Algae.	Control of discharges to Speedway Brook. Sediment control in impoundments. Pre-treatment of input to WWTP. Control nutrients.

Total miles assessed - 22.6
Total miles meeting standards - 3.7

MOUNT HOPE BAY DRAINAGE BASIN (61)

The Mount Hope Bay area encompasses sections of the towns of Rehoboth, Swansea, Dighton, Somerset, Fall River and Westport. The rivers typically have low flows due to the small drainage areas and are subject to tidal influences. Water quality data have been collected on the Lee, Cole and Quequechan Rivers.

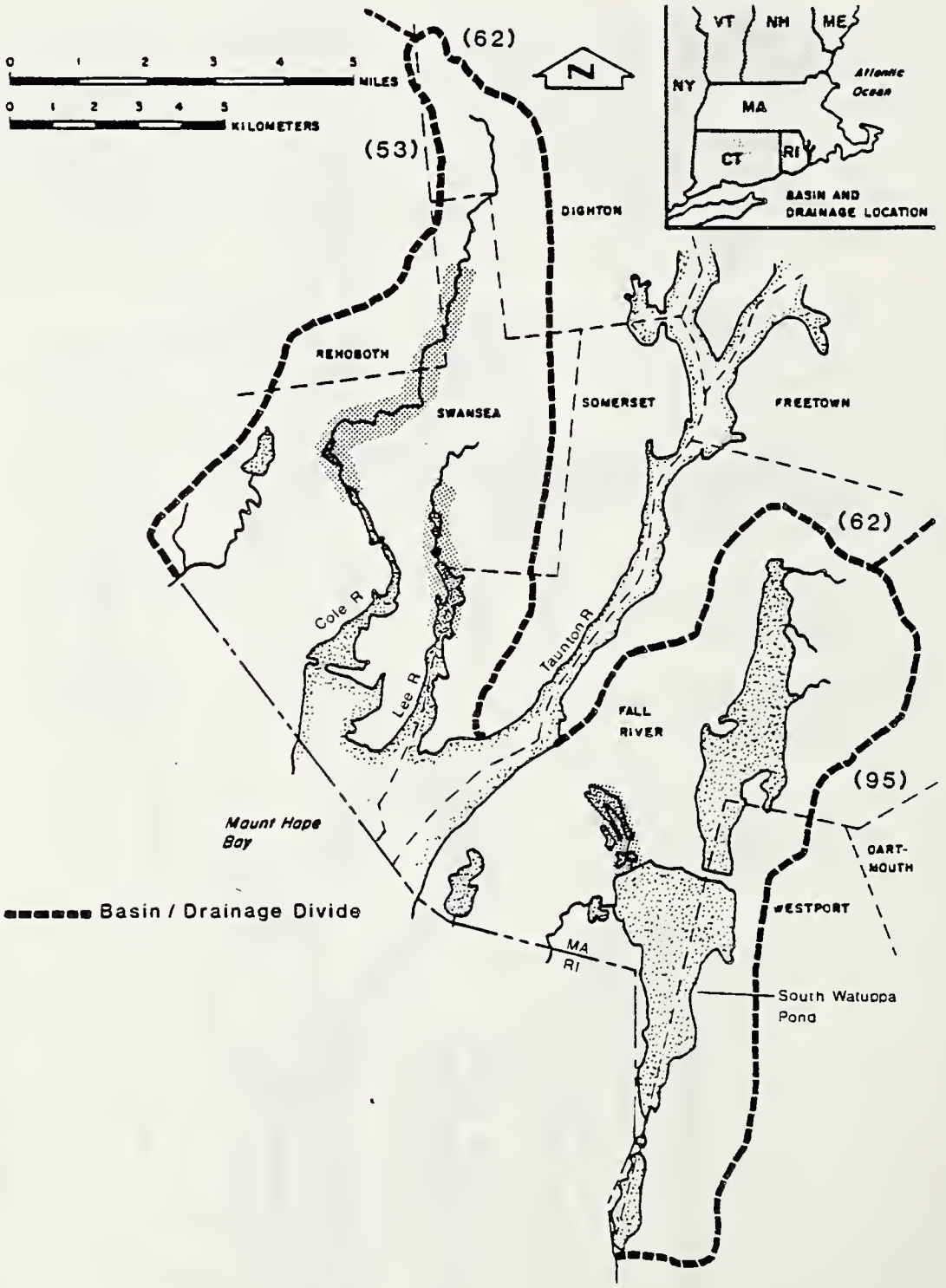


TABLE 20

MOUNT HOPE BAY DRAINAGE
DRAINAGE AREA 61

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Lee River	1.9-0.0	SB	Yes	1983	Coliform bacteria	Failing septic systems.	--
Cole River	3.1-0.0	SB	Yes	1983	Coliform bacteria	Failing septic systems.	--
Quequechan River	2.3-0.0	B	Yes	1983	Coliform bacteria	CSO	--

Total miles assessed - 7.3
Total miles meeting standards - 0.0

TAUNTON RIVER BASIN (62)

The Taunton River, located in southeastern Massachusetts, is formed at the confluence of the Matfield and Town Rivers in the town of Bridgewater. The river, 40 miles in length, flows in a southerly direction and discharges into Mount Hope Bay in the Narragansett Bay Watershed. Flowing unobstructed for its entire length, the Taunton River has an extremely flat gradient, ranging from approximately twenty feet at its origin to sea level in Mount Hope Bay. The river is fairly uniform in width in its freshwater portion and then broadens into an estuary. Saltwater intrusion occurs upstream to river mile 12 and tidal influence occurs upstream to river mile 18.

The watershed drains an area of 530 square miles with a myriad of tributary and sub-tributary systems contributing flow to the main stem of the Taunton River. At the headwaters of the basin, The Salisbury Plain and Satucket Rivers are the main contributors to the Matfield River while Coweeset and Queset Brooks are tributaries to the Town River. In the eastern portion of the basin, the Winnetuxet, Nemasket and Assonet Rivers are the major inputs while the Mill, Threemile and Segreganset Rivers are the major drainage areas in the western portion of the basin.

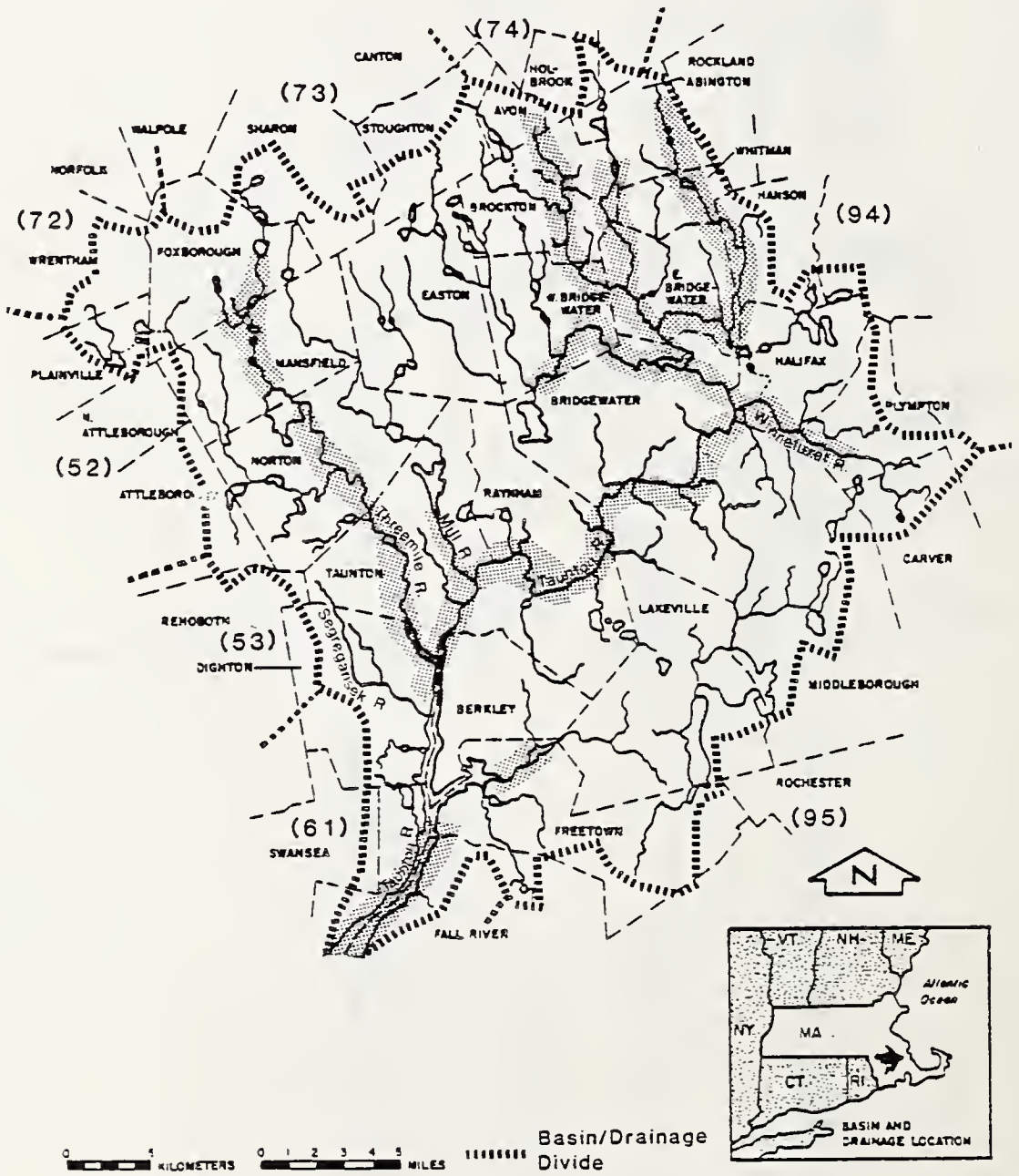


TABLE 21

TAUNTON RIVER BASIN
DRAINAGE AREA 62

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Taunton River from the confluence of the Town and Matfield Rivers to Route 24 bridge, Taunton	40.8-21.2	B	Yes	1975	Dissolved oxygen	Brockton WWTP. Bridgewater WWTP.	Brockton is being upgraded to AWT. Bridgewater is undergoing facilities planning.
Taunton River from the Route 24 bridge, Taunton to the Berkley Bridge, Dighton	21.2-13.0	SB	Yes	1975 1981	Dissolved oxygen	Upstream sources. Taunton WWTP.	Upstream control measures will reduce problems.
Taunton River from the Berkley Bridge, Dighton to Fall River city line	13.0-7.5	SB	No	1975 1981	--	--	--
Taunton River from the Fall River city line to mouth in Mount Hope Bay, Fall River	7.5-0.0	SB	Yes	1975	Coliform bacteria	CSO.	CSO control needed.
Matfield-Salisbury Plain River from Prospect Street, Brockton to confluence with the Town River, Bridgewater	53.3-40.8	B	Yes	1975 1983	Dissolved oxygen Coliform bacteria Ammonia	Urban runoff. Brockton WWTP.	Runoff control. Upgrading of WWTP will be completed in 1984.
Trout Brook from Route 28, Avon to confluence with the Salisbury Plain River, Brockton	4.0-0.0	B	Yes	1975	Dissolved oxygen Coliform bacteria	Eutrophication.	Possibly urban runoff control; source of problem not clearly defined.

TABLE 21 (CONTINUED)

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Beaver Brook from Groveland Street, Brockton to confluence with the Salisbury Plain River, East Bridgewater	5.5-0.0	B	Yes	1975	Dissolved oxygen Coliform bacteria	Wetlands. Stormwater.	Undefined.
Satucket-Shumatusacacant Rivers from Central Street, Abington to confluence with the Matfield River, East Bridgewater	14.4-0.0	B	Yes	1975	Dissolved oxygen Coliform bacteria	Wetlands.	Facilities planning for Abington and Whitman.
Town-Hockomock Rivers from the confluence of Queset and Coweeset Brooks, West Bridgewater to confluence with Matfield River, Bridgewater	11.7-0.0	B	Yes	1975	Dissolved oxygen	Wetlands. Eutrophication. Bridgewater WWTP.	Vast wetland area causes natural low dissolved oxygen. Bridgewater WWTP undergoing facilities planning.
Robinson Brook from Cocasset Street, Foxborough to confluence with Rumford River, Foxborough	3.0-0.0	B	Yes	1975	Dissolved oxygen Ammonia Coliform bacteria	Foxborough Co. WWTP.	Possible upgrading of WWTP.
Rumford-Threemile Rivers from Cocasset Street, Foxborough to confluence with Taunton River, Dighton	21.4-0.0	B	Yes	1975	Dissolved oxygen Coliform bacteria	Undetermined. Mansfield WWTP at river mile 15.8. CSO in Dighton.	Mansfield WWTP will be upgraded by 1985; upstream problems need to be qualified. Control and/or elimination of CSO problem in downstream section (river mile 1.3-0.0).

TABLE 21 (CONTINUED)

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Wading River from Spruce Street, Foxborough to confluence with Threemile River, Norton	11.3-0.0	B	No	1975	Dissolved oxygen	Wetlands.	Natural Condition.
Segreganset River from Center Street, Dighton to confluence with Taunton River, Dighton	2.5-0.0	B	Yes	1975	Dissolved oxygen Coliform bacteria	Diurnal variation unknown.	Further quantification of problem is needed.
Assonet River from Route 74, Freetown to confluence with Taunton River, Freetown	6.0-0.0	B	Yes	1975	Dissolved oxygen	Wetlands unknown.	Further qualification of problem is needed.
Queset Brook from outlet of Longwater Pond, Easton to confluence with Coweeset Brook, West Bridgewater	2.8-0.0	B	No	1975	--	--	--
Coweeset Brook from Pearl Street, Brockton to confluence with Queset Brook, West Bridgewater	3.6-0.0	B	No	1975	--	--	--
Winnetuxet River from Route 58 to confluence with Taunton River, Halifax	6.7-0.0	B	Yes	1975	Dissolved oxygen Coliform bacteria	Wetlands. Cropland drainage.	Natural condition. Proper control of fertilizer runoff needed.

TABLE 21 (CONTINUED)

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Nemasket River from Vaughan Street, Middleborough to confluence with the Taunton River, Middleborough	10.5-0.0	B	No	1975 1980 1981	Dissolved oxygen	Diurnal variation from macrophyte growth.	Natural condition.
Canoe-Snake Rivers from Cocasset Street, Foxborough to outlet of Lake Sabbatia, Taunton	18.2-3.1	B	No	1975	Dissolved oxygen	Wetlands.	Natural condition.
Mill River from outlet of Lake Sabbatia, Taunton to confluence with Taunton River, Taunton	3.1-0.0	B	Yes	1975 1981	Dissolved oxygen Coliform bacteria	CSO in Taunton.	Control and/or elimination of CSO.

Total miles assessed - 174.9
Total miles meeting standards - 48.8

BOSTON HARBOR (70)

Boston Harbor includes areas of Boston, Quincy, Hull, Hingham, and Weymouth. It extends from the Chelsea River, the Charles River Dam, and the confluence of the Neponset River with Dorchester Bay to a line connecting the Boston Lighthouse to Deer Island in Boston and Point Allerton in Hull. The harbor includes Fort Point Channel, Reserved Channel, Dorchester Bay, Quincy Bay, Hingham Bay and Hull Bay. Twenty-two of 28 islands in the Harbor Islands State Park lie within the area described here.

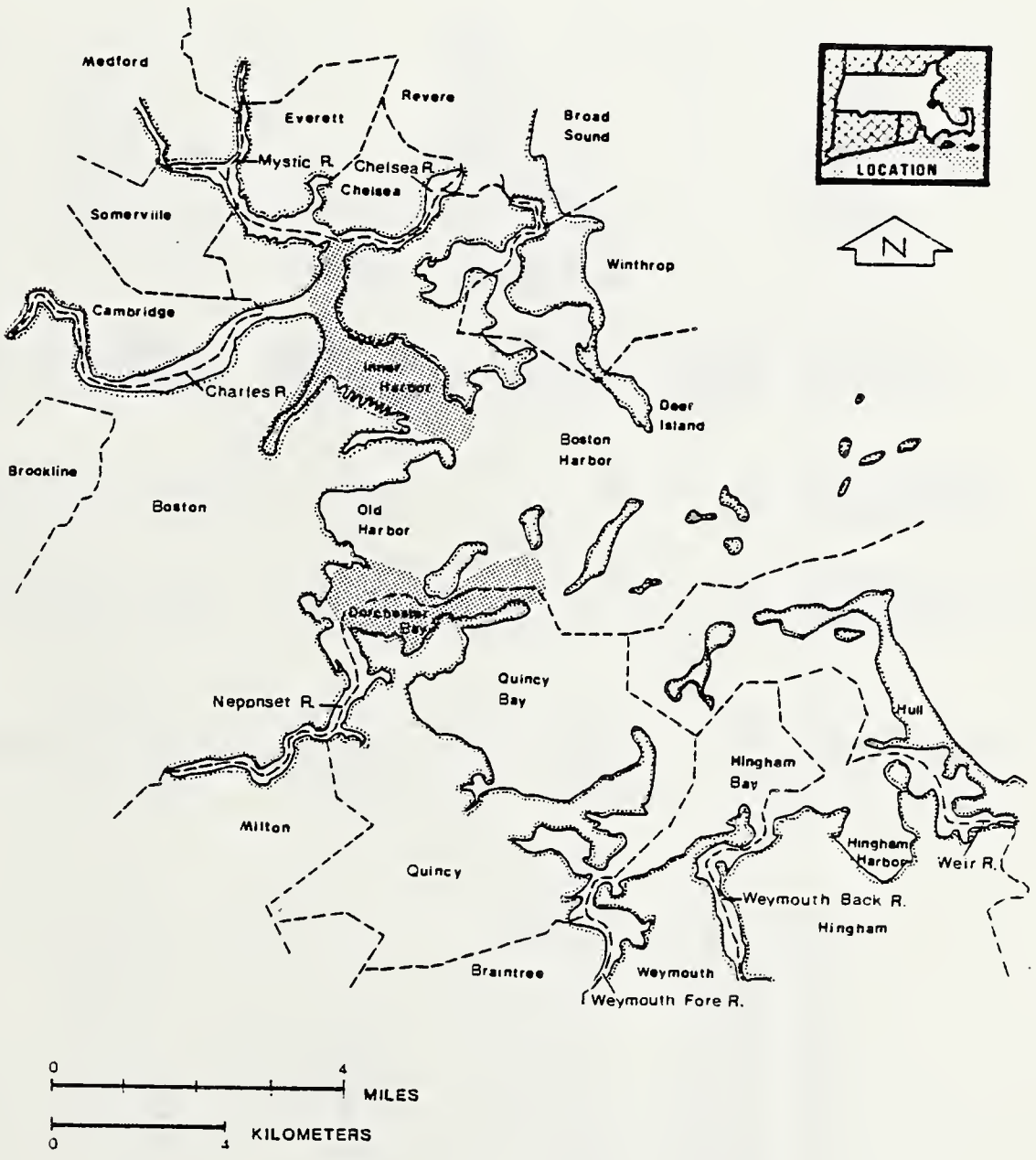


TABLE 22

BOSTON HARBOR
DRAINAGE AREA 70

SEGMENT DESCRIPTION	HARBOR AREA	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Outer Harbor (President Roads & Nantasket Roads)	24.15	SB	No	1972 1982 1983	--	--	--
Inner Harbor	2.21	SC	Yes	1972 1978 1982 1983	Metals Coliform Aesthetics Oil and grease Dissolved oxygen	Combined sewer overflows. In-place sediments. Debris. Water traffic.	CSO treatment proposed.
Fort Point Channel	0.053	SC	Yes	1972 1982 1983	Metals Coliform	In-place sediments. Combined sewer overflows.	CSO treatment proposed.
Reserved Channel	0.12	SC	Yes	1982 1983	Metals	In-place sediments. Combined sewer overflows.	CSO treatment proposed.
Dorchester Bay	3.35	SB	Yes	1968 1972 1982	Coliform Dissolved oxygen	Combined sewer overflows. Moon Island pumping station.	CSO separation.
Quincy Bay	-- 5.78	SA SB	Unknown No	None 1982 1983	-- Periodic coliform (beach closures) debris	-- Storm discharges Nut Island WWTP.	-- -- O&M correction

TABLE 22 (CONTINUED)

SEGMENT DESCRIPTION	HARBOR AREA	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Hingham Bay	6.98	SB	No	1982	--	--	--
	--	SA	Un-known	None	--	--	--
Hull Bay	2.18	SB	No	1982	--	--	--
Winthrop Bay	1.49	SB	No	1983	--	--	--

Total miles assessed - 46.31
Total miles meeting standards - 40.58

MYSTIC RIVER BASIN (71)

The Mystic River drains 69 square miles and is 17 miles in length. It runs through a watershed characterized by a high degree of urbanization in the north section of the Greater Boston area. The headwaters of the Mystic include the Aberjona River and Hall's Brook. Horn Pond Brook in Woburn, Mill Brook in Arlington, and Alewife Brook in Cambridge all contribute to the flows in the middle Mystic River. The Upper and Lower Mystic Lakes are found in the middle basin. Lower Mystic Lake is fed by Upper Mystic Lake and Mill Brook. In 1966, the Amelia Earhart Dam was built to prevent salt water intrusion into the lake. The outlet of the Lower Mystic Lake is recognized as the beginning of the Mystic River. It flows in a southeasterly direction, is joined by the Malden and Chelsea Rivers and discharges to Boston Harbor.

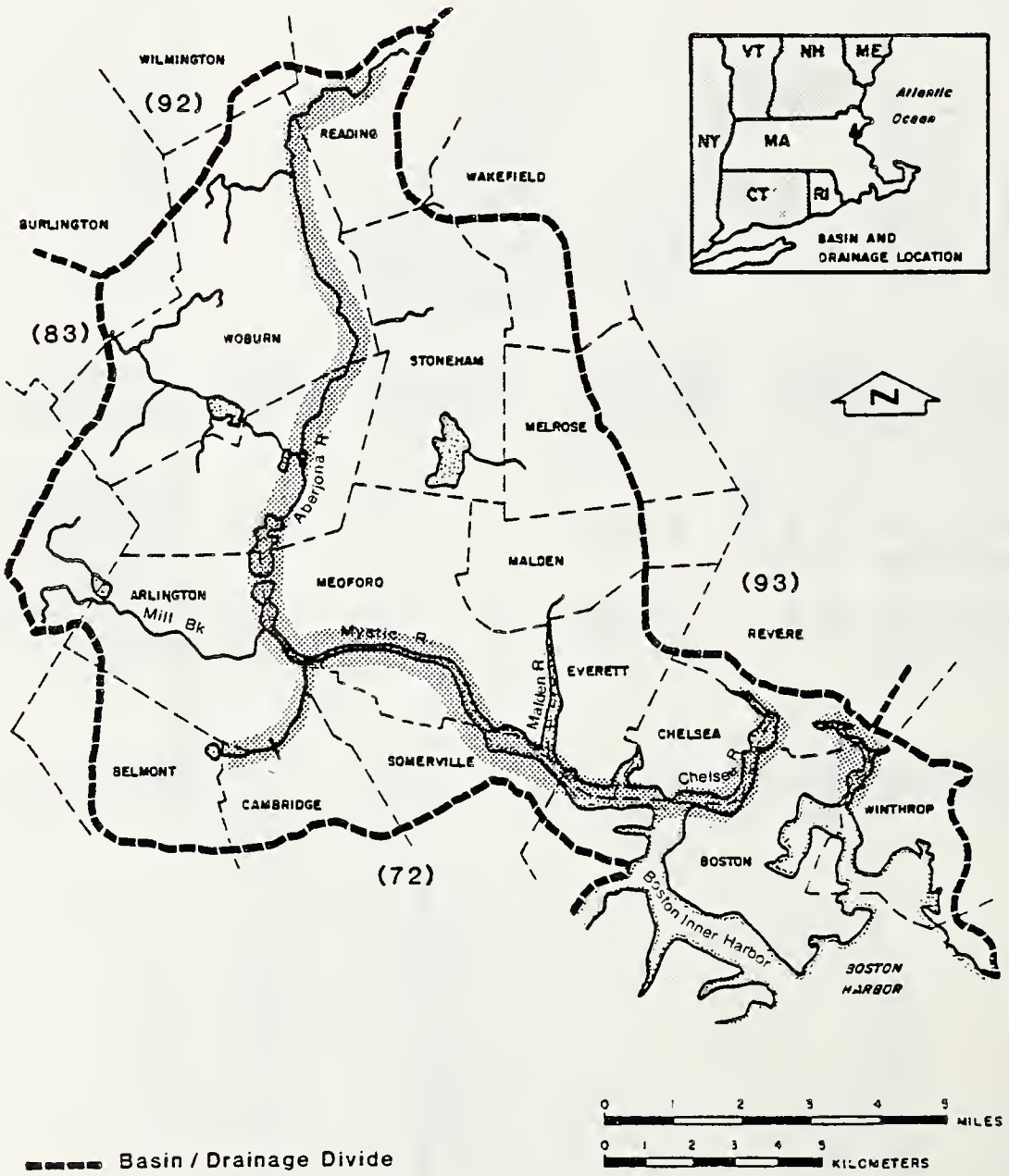


TABLE 23

MYSTIC RIVER BASIN
DRAINAGE AREA 71

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Aberjona River from its source in Reading to the Mystic Lakes. Upper and Lower Mystic Lakes. Mystic River to Amelia Earhart Dam, Somerville	18.4-2.0	B	Yes	1975 1976 1977 1978 1981	Ammonia Dissolved oxygen Coliform bacteria Metals	Leachate. CSO. Anoxic saline layer in Lower Mystic Lake.	Toxic element control and cleanup. CSO separation in Stoneham. Correction of saline layer in progress.
Mystic River from Amelia Earhart Dam to confluence with Chelsea River, Chelsea-Boston	2.0-0.0	SC	Yes	1982 1983	Coliform bacteria Oil & grease Dissolved oxygen Metals	CSO. Water traffic.	CSO treatment.
Alewife Brook from Fresh Pond, Cambridge to confluence with Mystic River, Arlington-Somerville	2.0-0.0	B	Yes	1975 1976 1978 1981	Coliform bacteria Dissolved oxygen Ammonia	CSO.	CSO separation and/or treatment.
Chelsea River from source to confluence with Mystic River, Boston	3.5-0.0	SC	Yes	1972 1978 1982 1983	Coliform bacteria Oil & grease Metals Dissolved oxygen	CSO.	CSO treatment proposed.
Sales Creek	2.0-0.0	B	Yes	1983 1984	Wetweather violations.	CSO.	--

Total miles assessed - 25.9
Total miles meeting standards - 0.0

CHARLES RIVER BASIN (72)

The Charles River, the longest river in Massachusetts with a length of 80 miles, meanders its way through numerous communities in eastern Massachusetts and culminates by discharging into Boston Harbor at the outlet of the Charles River Basin. The initial flow of the river is southerly through towns of Milford and Hopedale and then pursues a zig-zag route in a generally northeasterly direction. In the town of Dedham, approximately one-third of the Charles River flow is diverted through the Mother Brook diversion to the Neponset River. The diversion was originally constructed for hydro-power but its current status has been relegated to flood control purposes. The river basin encompasses an area of 307 square miles and is somewhat hour-glassed in shape. With a beginning elevation of 500 feet above mean sea level, the river ends at sea level in Boston Harbor.

The Charles Basin is bounded at its upstream end by the Watertown Dam, and at its downstream end by the new Charles River Dam. The Charles River in the Charles Basin is 8.6 miles long and has a net drainage area of 39 square miles. The only tributary to the Charles Basin is the Back Bay Fens, which includes the Muddy River and Stony Brook.

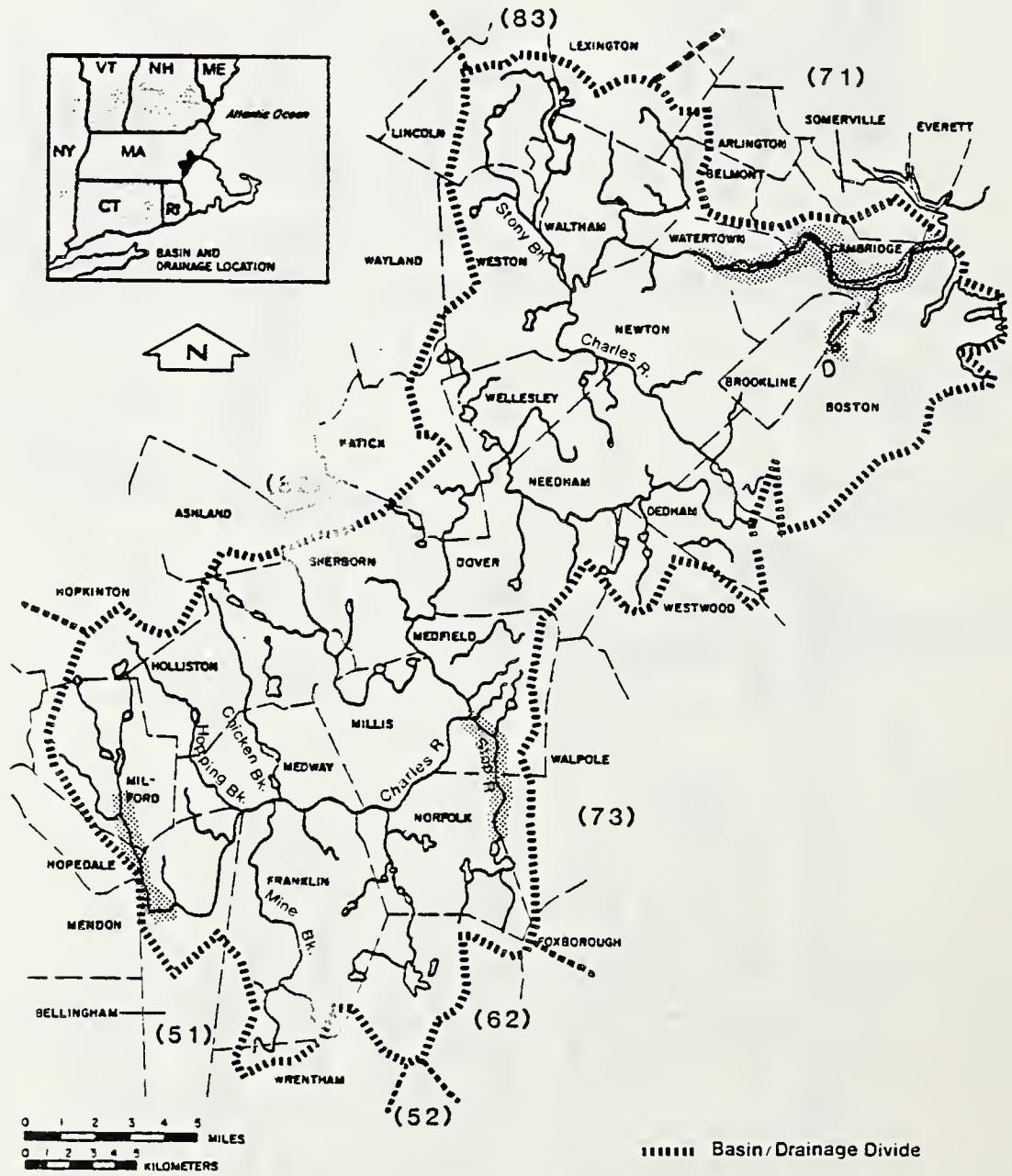


TABLE 24

CHARLES RIVER BASIN
DRAINAGE AREA 72

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Charles River from its headwaters in Hopkinton to Dilla Street, Milford	78.9-76.5	A	No	1973 1978 1980	--	--	--
Charles River from Dills Street, Milford to Beech Street, Bellingham	76.5-64.7	B	Yes	1973 1978 1980 1981	Dissolved oxygen Coliform bacteria	Undefined urban runoff. Milford WWTP impoundments.	Control at Cedar Swamp Pond; runoff control. Upgrading of Milford WWTP control of eutrophication and sediment in impoundments.
Charles River from Beech Street, Bellingham to Watertown Dam, Watertown	64.7-9.8	B	No	1973 1978 1980 1981	Diurnal dissolved oxygen	Algal, macrophyte activity.	Inherent condition, probably will continue.
Stop River from headwaters in Wrentham to Norfolk-Walpole MCI WWTP, Walpole	8.8-4.1	B	No	1973 1978 1980	--	--	--
Stop River from Norfolk-Walpole MCI WWTP to confluence with the Charles River, Medfield	4.1-0.0	B	Yes	1973 1978 1980	Dissolved oxygen	Norfolk-Walpole MCI WWTP. Natural wetlands.	Evaluation and control of WWTP natural condition, low dissolved oxygen levels will continue.

TABLE 24 (CONTINUED)

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Charles Basin from Watertown Dam to the Science Park Dam, Boston	9.8-1.2	C	Yes	1974 1976 1977	Intermittent Coliform Dissolved oxygen	Combined sewer overflows. In-place sediments and salt water intrusion.	Combined sewer separation. Destratification by mixing in progress.
Back Bay Fens from the Muddy River to confluence with the Charles Basin, Boston	1.5-0.0	C	Yes	1974 1982	Coliform Dissolved oxygen	Combined sewer overflows. In-place sediments and combined sewer overflows.	Combined sewer separation. Dredging of sediments.
Muddy River from Jamaica Pond to the Back Bay Fens, Boston	2.7-0.0	B	Yes	1974 1982	Coliform Dissolved oxygen	Combined sewer overflows.	Combined sewer separation.

Total miles assessed - 90.7
Total miles meeting standards - 62.0

NEPONSET RIVER BASIN (73)

The Neponset River Basin borders the city of Boston on the north and Quincy on the south; it drains a watershed of 123 square miles. The river flows to Dorchester Bay after traveling approximately 30 miles.

The East Branch is the major tributary to the main stem Neponset. Mother Brook, a man-made diversion, conveys one-third of the Charles River flow to augment low flows in the Neponset.

Most of the Neponset River is a fresh water stream. However, after being impounded in Milton by the Walter Baker Dam, the river becomes tidal.

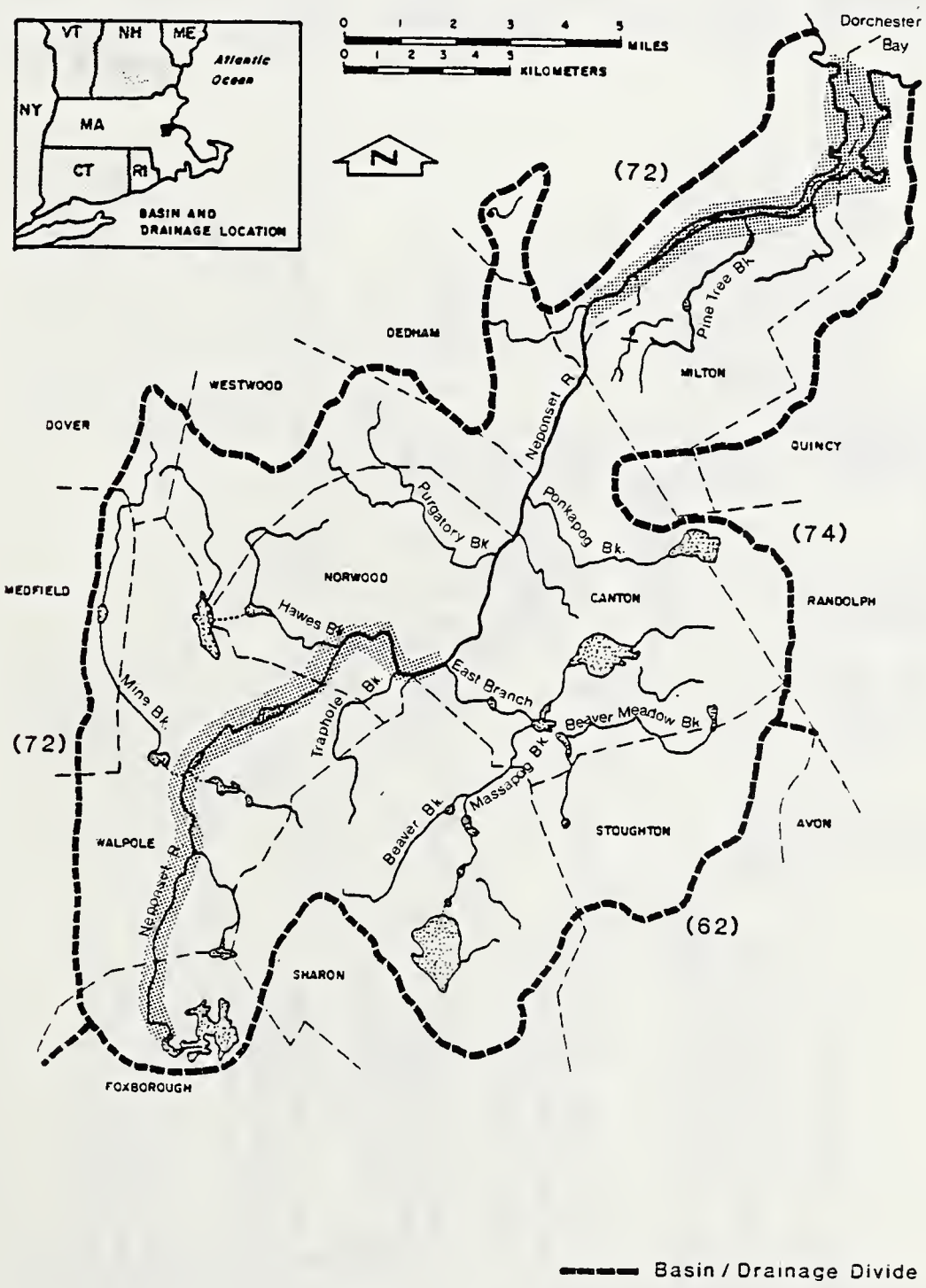


TABLE 25

NEPONSET RIVER BASIN
DRAINAGE AREA 73

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Neponset River from Neponset Reservoir, Foxborough to confluence with East Branch, Canton	29.5-15.8	B	Yes	1977 1978	Periodic coliform. Diurnal oxygen in impoundments.	Eutrophication. Urban runoff.	--
Neponset River from the East Branch to confluence with Mother Brook, Boston	15.8-7.9	B	No	1977 1978	--	--	--
Neponset River from Mother Brook to Milton Lower Falls Dam, Milton-Boston	7.9-4.2	B	Yes	1977 1978	Coliform	Combined sewer overflows.	Combined sewer separation.
Neponset River from Milton Lower Falls Dam to Dorchester Bay, Boston-Quincy	4.2-0.0	SB	Yes	1978	Dissolved oxygen Coliform	Combined sewer overflows.	Combined sewer separation.
Mother Brook from Mother Brook Dam, Dedham to confluence with Neponset River, Boston	3.1-0.0	B	No	1976	--	--	--

Total miles assessed - 32.6
Total miles meeting standards - 11.0

WEYMOUTH AND WEIR RIVER BASIN (74)

The Weymouth Fore River drains portions of the communities of Holbrook, Avon, Brockton, Randolph, Milton, Quincy, Braintree, and Weymouth. The river is approximately 12 miles in length. The headwaters are referred to as the Cochato River, the middle portion is called the Monatiquot River, and the lower tidal portion is known as the Weymouth Fore River. The river discharges into Hingham Bay. The area drained by the Weymouth Fore is 42.25 square miles.

The Weymouth Back River drains an area of 26.5 square miles and includes portions of the towns of Weymouth, Hingham, Holbrook, Braintree, and Rockland. Two tributaries form the headwaters of the Weymouth Back River. They are the Old Swamp River and the Mill River.

The Weir River has its headwaters in Weymouth, and flows the remainder of its length through Hingham to Hingham Bay. The tidal portion also drains sections of Hull and Cohasset.

TABLE 26

WEYMOUTH AND WEIR RIVER BASIN
DRAINAGE AREA 74

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Monatiquot River from source to Weymouth Fore River, Braintree	8.3-5.1	B	Yes	1975 1982	Dissolved oxygen Coliform	Urban runoff. Septic system failure.	Sewer extensions to Metropolitan Sewerage District in progress.
Weymouth Fore River from Monatiquot River to Hingham Bay, Weymouth-Quincy	5.1-0.0	SB	Yes	1970 1973	Coliform	Urban runoff. Septic system failure.	Sewer extentions to Metropolitan Sewerage District in progress.
Weymouth Back River from Whitmans Pond to Fresh River, Weymouth	4.5-3.2	B	No	1975 1982	--	--	--
Weymouth Back River from the Fresh River to Hingham Bay, Weymouth-Hingham	3.2-0.0	SB	Yes	1973	Coliform	Urban runoff. Septic system failure.	Sewer extentions to Metropolitan Sewerage District in progress.
Weir River from outlet Straits Pond in Hingham to Hingham Bay	0.9-0.0	SB	Yes	1982	Coliform	CSO	CSO treatment or separation.

Total miles assessed - 13.7
Total miles meeting standards - 1.3

NASHUA RIVER BASIN (81)

The Nashua River, located in north central Massachusetts and southern New Hampshire, consists of a north branch and a south branch which combine in Lancaster, Massachusetts to form the main stem. The river then flows in a northeasterly direction until it joins the Merrimack River in Nashua, New Hampshire. The river's 530 square mile drainage area lies primarily within Worcester and Middlesex counties in Massachusetts and includes the 115 square mile watershed of the Metropolitan District Commission's Wachusett Reservoir. However, only 12 million gallons of water per week are released to the south branch from this reservior. As a result the Wachusett watershed has only minor importance with respect to the flow in the rest of the river basin.

From the headwaters of the north branch in Fitchburg to the confluence with the south branch, a distance of 19 miles, the river elevation drops 360 feet. The main stem then falls another 110 feet along its remaining 37 mile course to the Merrimack River. The United States Geological Survey maintains a single flow-gaging station on the main stem at East Pepperell. The flow at this station over the past forty years averaged 560 cubic feet-per-second (cfs). Gaging stations are located on the north branch of the Nashua River in Leominster and Fitchburg. The average flow at the Leominster gage over the same forty-year period was 193 cfs. The new gage at Fitchburg showed average yearly flows of from 96 to 141 cfs from 1975 to 1980.

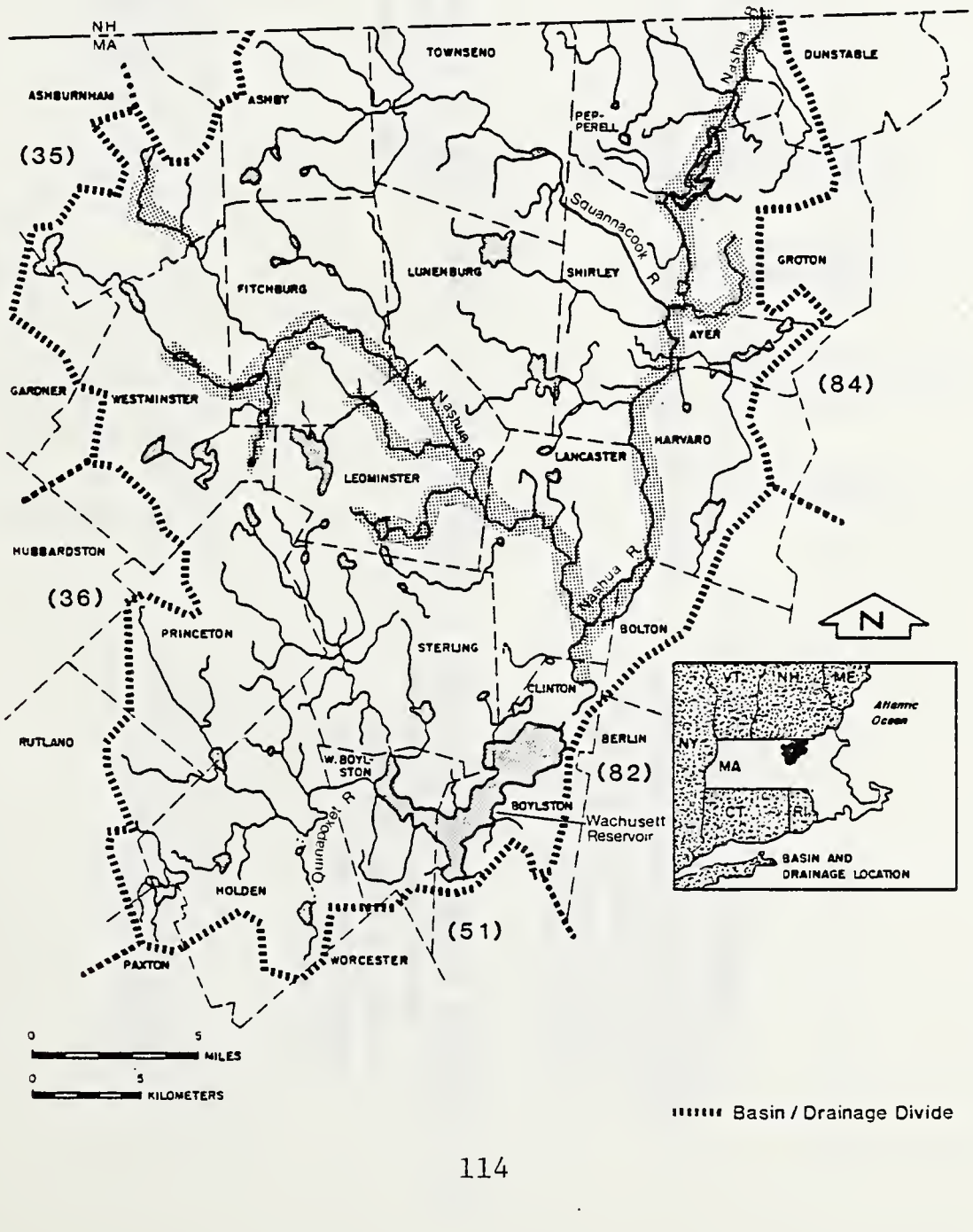


TABLE 27

NASHUA RIVER BASIN
DRAINAGE AREA 81

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
North Branch Nashua River from Fitchburg West WWTP to confluence with South Branch, Lancaster	56.1-36.5	B	Yes	1977 1981 1982	Dissolved oxygen Coliform bacteria	CSO Urban runoff. Fitchburg West WWTP.	Facilities planning in progress for CSO and operational problems at Fitchburg West WWTP.
Nashua River from confluence of North and South Branches to Massachusetts-New Hampshire state line, Pepperell	36.5-10.5	B	Yes	1977 1981 1982	Dissolved oxygen Coliform bacteria Excessive algae	Upstream discharges in Leominster and Clinton. Urban runoff from Fort Devens.	Leominster WWTP upgraded in 1983. Upgrading of MDC-Clinton WWTP in progress.
South Branch Nashua River, entire length	4.6-0.0	B	Yes	1977 1982	Coliform bacteria Dissolved oxygen Plant nutrients	Urban runoff. MDC-Clinton secondary WWTP.	Best management practices recommended in MRPC 208 report. MDC-Clinton WWTP is in design phase for conversion to advanced secondary treatment.
Flag Brook from outlet of Crocker Pond to confluence with the Whitman River, Fitchburg	2.7-0.0	B	Yes	1980 1981	Dissolved oxygen Suspended solids Aesthetics	Fitchburg landfill leachate.	Refine treatment.

TABLE 27 (CONTINUED)

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Whitman river, entire length	6.7-0.0	B	Yes	1977	Coliform bacteria	Non-point sources. Untreated municipal discharges in South Ashburnham.	Facilities planning underway for collection and treatment of sewage in problem areas throughout Ashburnham.
Phillips Brook, entire length	8.0-0.0	B	Yes	1977 1981	Coliform bacteria	Non-point sources. Combined sewer overflows in Fitchburg.	Facilities planning for CSO management pending due to local funding constraints.
Monoosnoc Brook, downtown Leominster segment only	1.5-0.0	B	Yes	1977 1981	Coliform bacteria BOD	Combined sewer overflows in Leominster. Urban runoff.	Sewerage system rehabilitation projects ongoing in Leominster.
Fall Brook, entire length	3.0-0.0	B	Yes	1977 1981	Coliform bacteria	Combined sewer overflows in Leominster. Urban runoff.	Sewerage system rehabilitation.
Still River, entire length	3.1-0.0	B	Yes	1977 1981	Dissolved oxygen Coliform bacteria	Natural sluggish flow. Lancaster School for Girls sand filters are suspect.	Further survey work needed, to determine necessary abatement.

TABLE 27 (CONTINUED)

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Catacoonamug Brook, entire length	2.0-0.0	B	No	1981	--	--	--
Nonacoicus Brook, entire length	1.5-0.0	B	No	1979 1981	--	--	--
Squannacook River, entire length	14.3-0.0	B	Un-known	1977	Coliform bacteria	Septic system failures in Townsend. Runoff in West Groton.	Nonstructural wastewater management alternatives as outlined in MRPC 208 report.
James Brook, entire length	4.4-0.0	B	Yes	1977 1981	Coliform bacteria Excessive algae	Non-point sources. Septic system failures suspected.	Facilities planning completed (funding voted down) for town of Groton.
Nissitissit River, Massachusetts segment	4.5-0.0	B	No	1977 1981	--	--	--

Total miles assessed - 87.6
Total miles meeting standards - 8.0

CONCORD RIVER BASIN (82)

The Assabet River has its beginnings in the town of Westborough. It flows northeasterly for 31 miles through the towns of Northborough, Hudson, Maynard, and Concord. The Assabet River drains an area of 175 square miles.

The Sudbury River is 41 miles long with a drainage area of 160 square miles, 29 of which drain to the MDC reservoirs. In Concord, the Sudbury River joins the Assabet River to form the Concord River.

The Concord River flows north through the towns of Concord, Carlisle, Bedfor, and Billerica, and the city of Lowell where it flows into the Merrimack River. The Concord River retains the slow-moving characteristic of the Sudbury River as it flows north through the Great Meadows Wildlife Refuge Area. From the Talbot Dam in Billerica, the river is an urban river, receiving industrial and municipal discharges in the Lowell area.

The Concord River is 15.8 miles long and drains 62 square miles, for a combined total (including the Assabet and Sudbury rivers) of 406 square miles. The Concord River Basin has two main urban centers in the Lowell and Concord areas, and some rural areas such as those still found in Carlisle.

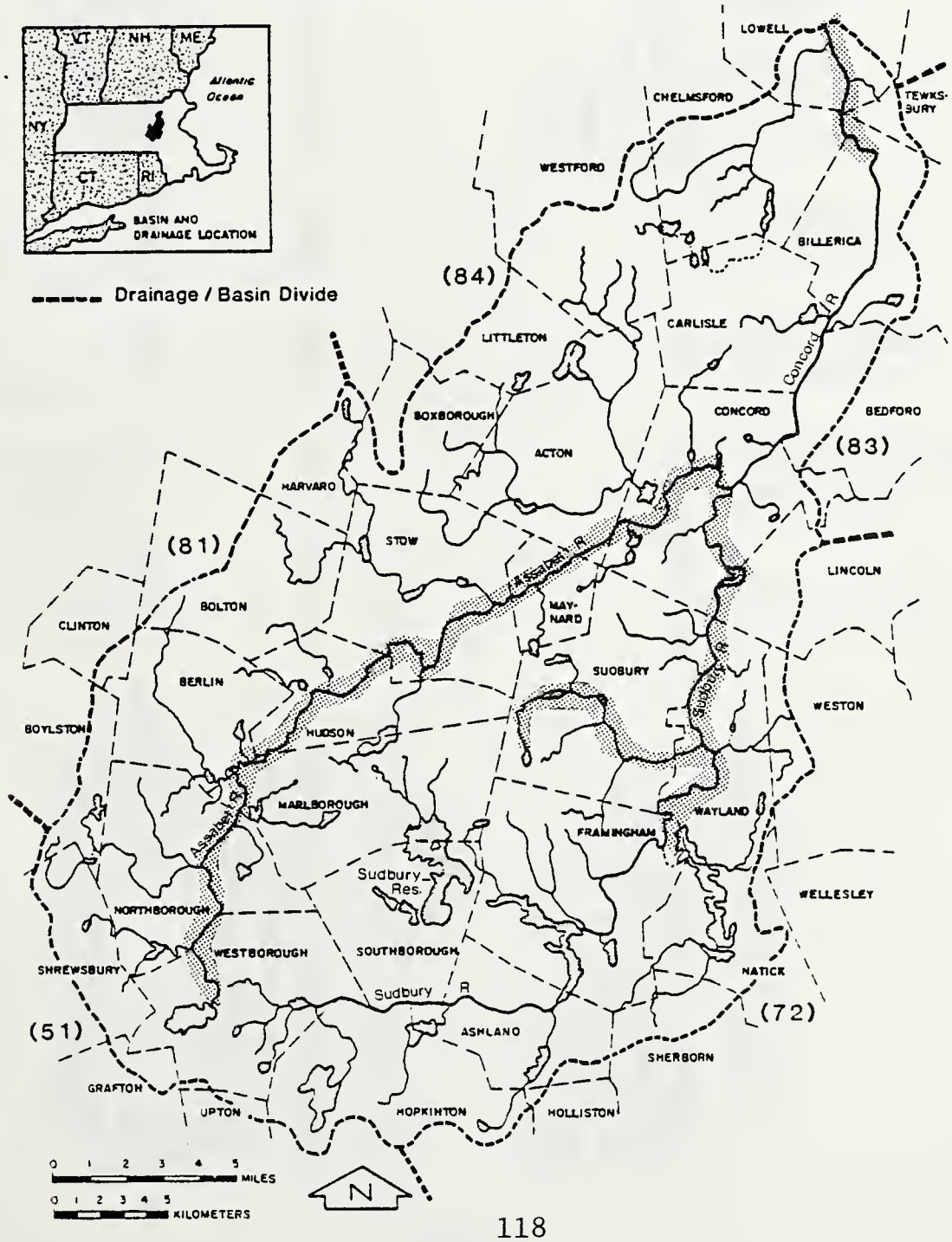


TABLE 28

CONCORD RIVER BASIN
DRAINAGE AREA 82

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Assabet River from Flow Augmentation Pond in Westborough to confluence with Sudbury River, Concord	31.0-0.0	B	Yes	1979	Dissolved oxygen Coliform bacteria Nutrients Ammonia Solids.	Natural conditions. Westborough WWTP. Shrewsbury WWTP. Marlborough Westerly WWTP. Hudson WWTP. Maynard WWTP. Impoundments.	Upgrading of all treatment plants in progress.
Sudbury River from source in Westborough to Saxonville Pond outlet, Framingham	32.7-16.2	B	No	1979	Dissolved oxygen	Natural conditions.	--
Sudbury River from Saxonville Pond to confluence with Assabet River, Concord	16.2-0.0	B	Yes	1979	Dissolved oxygen Coliform bacteria	Septic systems. Runoff. Natural conditions.	--
Hop Brook from Marlborough Easterly WWTP to confluence with Sudbury River, Wayland	9.7-0.0	B	Yes	1979	Dissolved oxygen Algae	WWTP dominates flow. Impoundments.	--
Concord River from source in Concord to Billerica WWTP, Billerica	15.4-6.1	B	No	1979	--	--	--

TABLE 28 (CONTINUED)

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Concord River from Billerica WWTP to confluence with Merrimack River, Lowell	6.1-0.0	B	Yes	1979	Coliform bacteria	CSO. Urban runoff.	CSO were eliminated after 1979 survey.

Total miles assessed - 88.8
Total miles meeting standards - 25.8

SHAWSHEEN DRAINAGE AREA (83)

The Shawsheen River originates near Hanscom Air Force Base in Bedford and flows generally northeast through Billerica, Tewksbury, and Andover where it enters the Merrimack River in south Lawrence. In its 25 mile length, the Shawsheen drains an area of approximately 77 square miles and falls 70 feet. Dams create two impoundments along its entire length. The main stem is fed by numerous small brooks and streams along its path to the Merrimack River. For nearly half its length, the Shawsheen meanders through marshy wetland areas.

The only United States Geological Survey gaging station on the Shawsheen is located at the Billerica-Wilmington town line on Route 129, near the old Middlesex Canal. The drainage area at this point is 35.1 square miles. The average discharge since the gage was constructed in 1964 has been 50.9 cubic feet per second (cfs). The maximum discharge recorded was 1,050 cfs on March 19, 1968, and the minimum discharge recorded was 1.2 cfs on August 30, 1966.

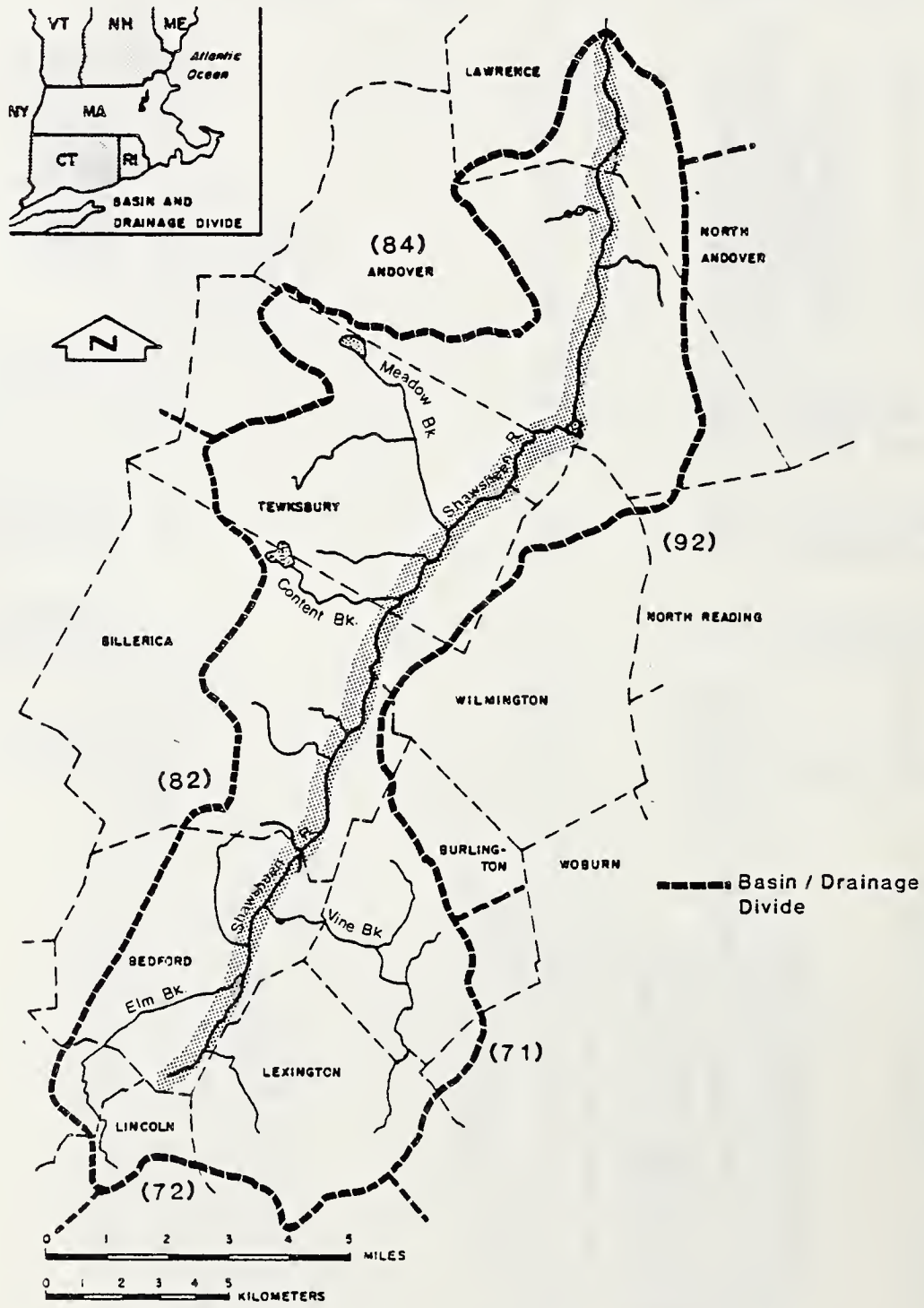


TABLE 29

SHAWSHEEN RIVER BASIN
DRAINAGE AREA 83

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Shawsheen River from Maguire Road, Bedford to confluence with Merrimack River, Lawrence	25.0-0.0	B	Yes	1979 1981 1982	Coliform bacteria Dissolved oxygen	Natural conditions. Urban runoff.	Initiate stormwater management practices in Bedford, Andover and Lawrence as outlined in 208 plans.

Total miles assessed - 25.0
Total miles meeting standards - 0.0

MERRIMACK RIVER BASIN (84)

The Merrimack River is formed in Franklin, New Hampshire at the confluence of the Pemigewasset and Winnipesaukee Rivers. It flows 116 miles through the central portion of New Hampshire and Massachusetts and flows 38 miles to the city of Newburyport where it empties into the Atlantic Ocean. The Merrimack River drainage basin, fourth largest in New England, is comprised of a total of 5,010 square miles in New Hampshire and Massachusetts. Only 24 percent, or approximately 1,200 square miles, of the watershed are located within the Commonwealth of Massachusetts. From the state line to the Merrimack estuary, a distance of 50 miles, the river drops 90 feet in elevation. This drop includes flow over major dams in the cities of Lowell and Lawrence which also mark the location of significant flow diversions through extensive canal systems. The United States Geological Survey (USGS) maintains a flow monitor on the Merrimack River at Lowell. The average discharge at this gage over 55 years of record is 7,474 cubic feet per second (cfs) and the seven-day, ten-year low flow is approximately 940 cfs.

The maximum length of the Merrimack estuary is nine miles. It drains a total of 4,208 acres of salt marsh. The surface area of the estuary at mean low water is 3.29 mi^2. At mean high water the surface area is 6.18 $mi.^2$ and the total volume is 1,884,405,600 cubic feet. The effects of the ocean tides extend 22 miles upstream to Haverhill.

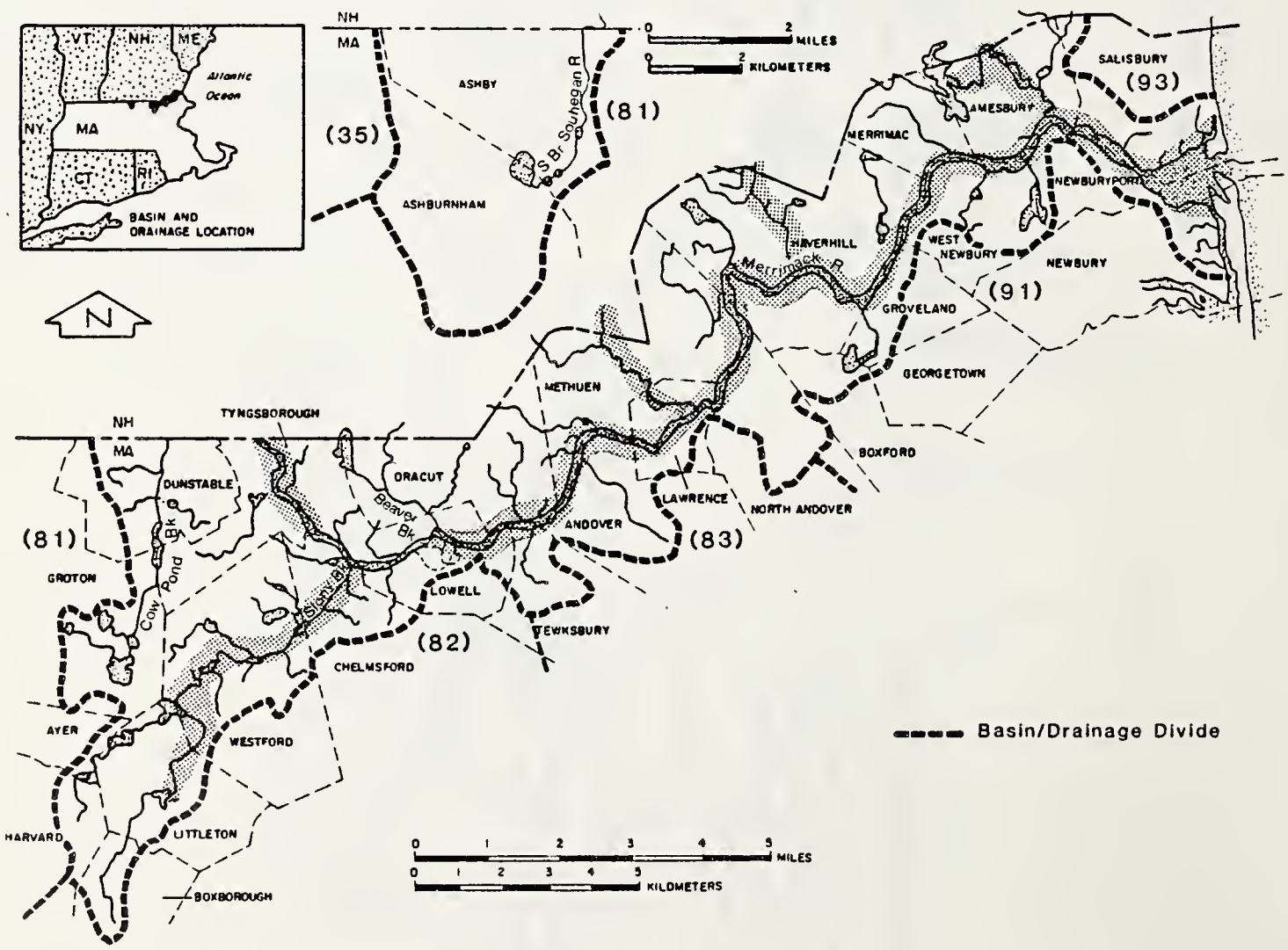


TABLE 30

MERRIMACK RIVER BASIN
DRAINAGE AREA 84

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Merrimack River from Mass.-NH line to Tyngsborough Bridge	49.8-47.4	B	Yes	1979 1981	Coliform bacteria	NH discharges Nashua River.	City of Nashua WWTP upgrading from primary to secondary treatment is in design phase.
Merrimack River from Tyngsborough Bridge to Pawtucket Dam, Lowell	47.4-40.6	B	No	1979 1981	--	--	--
Merrimack River from Pawtucket Dam to Creek Brook, Haverhill	40.6-21.9	B	Yes	1979 1981	Coliform bacteria Excessive algae	Combined sewer overflows and untreated discharges in Lowell. CSO in Lawrence.	Combined sewer overflows to be eliminated pending adequate funding. Untreated dry-weather flows to be tied in to Lowell (Duck Island) municipal WWTP by 1986.
Merrimack River from Creek Brook to Rocks Bridge, Haverhill-West Newbury	21.9-11.8	SB	Yes	1979 1981	Coliform bacteria	Upstream discharges. Combined sewer overflows in Haverhill.	Combined sewer overflows to be eliminated pending adequate funding.
Merrimack River from Rocks Bridge to Routes 1 and 1A Bridge, Newburyport	11.8-3.0	SB	No	1979 1981	--	--	--

TABLE 30 (CONTINUED)

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Merrimack River from Routes 1 and 1A Bridge to the Atlantic Ocean	3.0-0.0	SB	Yes	1980 1981	Coliform bacteria	Untreated wastewater discharges in Salisbury. Newburyport primary WWTP.	Secondary WWTP for Salisbury in design phase. Newburyport WWTP upgrading to secondary treatment presently nearing completion.
Stony Brook, entire length	10.3-0.0	B	Yes	1979	Coliform bacteria Excessive algae	Non-point. Urban runoff. Untreated wastewater discharges in Chelmsford.	Facilities planning in Chelmsford completed.
Beaver Brook, Massachusetts portion	4.2-0.0	B	Yes	1979 1981	Coliform bacteria	Urban runoff. Untreated discharges in Lowell.	Tie in to Lowell (Duck Island) municipal WWTP by 1986.
Spicket River, entire Massachusetts portion	6.4-0.0	B	Yes	1979 1981	Coliform bacteria Dissolved oxygen Phosphorus	Untreated discharges in Salem, NH and Lawrence. Industrial discharges.	Spicket River interceptor to tie in to Greater Lawrence WWTP. Time schedule pending wastewater management decisions for Salem, NH

TABLE 30 (CONTINUED)

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Little River, Massachusetts portion	4.3-0.0	B	Yes	1974	Dissolved oxygen Solids Coliform bacteria	Untreated discharges in Plaistow, NH, and Haverhill. Combined sewer overflows in Haverhill.	Little River Interceptor and CSO facility plan in preparation for Haverhill.
Powwow River, Massachusetts portion	6.4-0.0	B/SB	Yes	1979 1981	Coliform bacteria	Untreated municipal discharges in Amesbury center. Urban runoff.	Facilities plan for sewerage system expansion in preparation for Amesbury.
Black Rock Creek, entire length	1.7-0.0	SB	Yes	1974 1980	Dissolved oxygen Coliform bacteria Solids	Untreated and partially treated municipal discharges in Salisbury.	Salisbury WWTP going to design phase pending review of facilities plan and Environmental Impact Report.

Total miles assessed - 83.1
Total miles meeting standards - 15.6

PARKER RIVER BASIN (91)

The Parker River Basin lies between the drainage basins of the Ipswich and Merrimack Rivers in northeastern Massachusetts. All or part of nine communities lie within the 60 square mile area drained by the Parker River. The basin is generally rural-residential in nature, with only minor industrial development.

The Parker River rises at the confluence of two unnamed brooks in a wetland area in West Boxford. The river flows generally in a northeasterly direction through several small ponds and extensive wetland areas in the towns of Boxford, Georgetown, Groveland, and Newbury. In Newbury, the Parker River becomes tidal, with the last nine miles of the river subject to the rise of the tide. The Parker River flows through extensive coastal wetlands to its mouth where it empties into Plum Island Sound.

The Parker River is 23 miles long, drains 60 square miles, and has an average discharge into Plum Island Sound of 97.2 cfs. From its source to its mouth, the Parker River falls a total of 95 feet, of which 36 feet are taken up by the six dams located on the river.

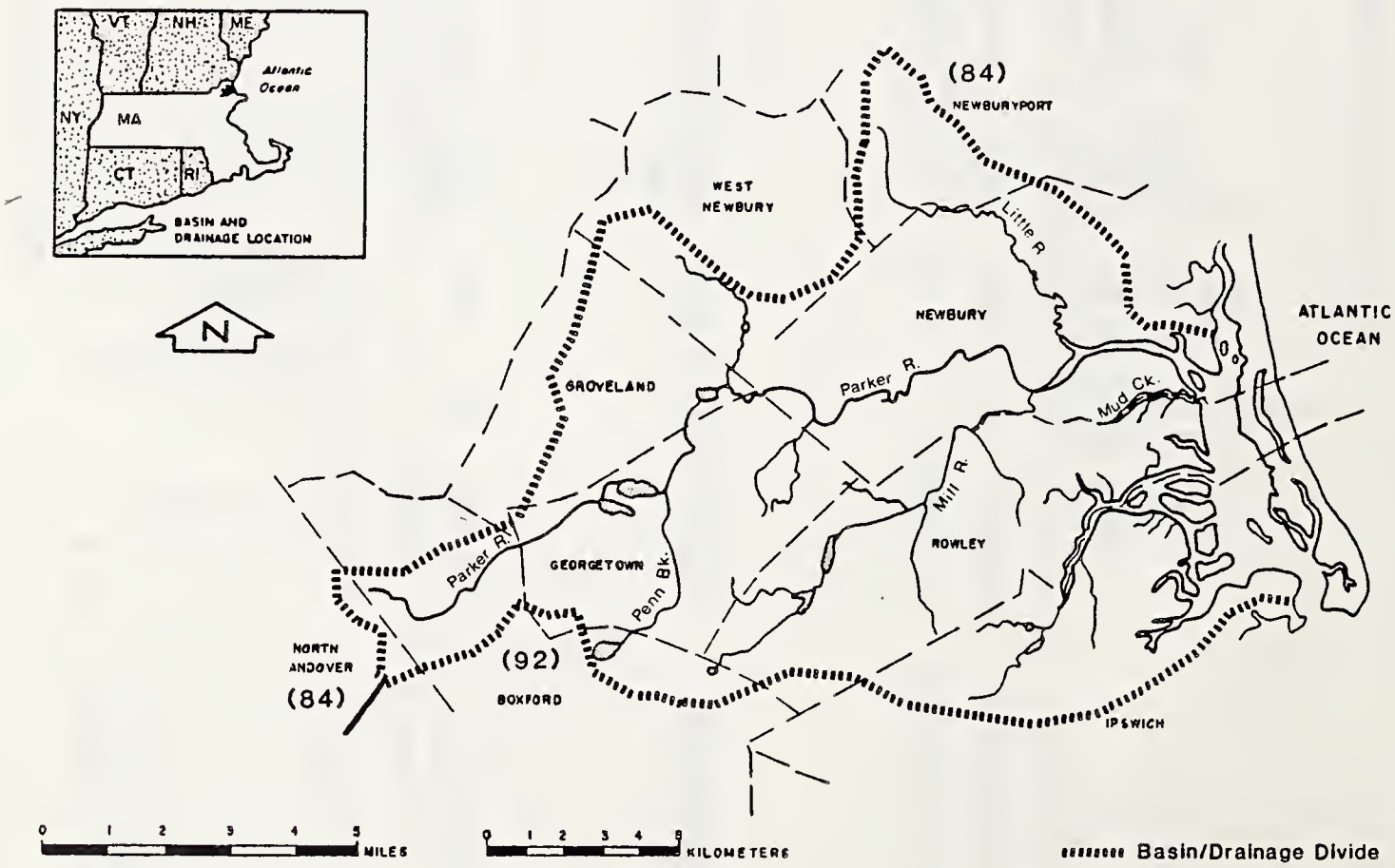


TABLE 31

PARKER RIVER BASIN
DRAINAGE AREA 91

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Parker River, from its source in Boxford to Central Street, Newbury	22.0-9.0	B	No	1975 1978 1983	Dissolved oxygen Coliform bacteria	Natural conditions. Storm runoff.	None.
Parker River from Central Street, Newbury to its mouth at Plum Island Sound	9.0-0.0	SB	No	1975 1978 1983	Dissolved oxygen Coliform bacteria	Natural conditions. Isolated problems.	None.

Total miles assessed - 22.0
Total miles meeting standards - 22.0

IPSWICH RIVER BASIN (92)

The Ipswich River Basin is located in northeastern Massachusetts and encompasses a drainage area of 155 square miles. The river rises in the town of Burlington and follows a meandering northeasterly course to the town of Ipswich, where it drains into the Atlantic Ocean. The major tributaries to the Ipswich River are Martins Brook, Boston Brook, Fish Brook and the Miles River.

From its source to its mouth, the Ipswich River experiences a vertical fall of 115 feet, of which approximately 30 feet are taken up by the three dams on the river. At its mouth, the river has a total drainage area of 155 square miles with an average discharge of 249 cubic feet-per-second (cfs) to the Atlantic Ocean. The United States Geological Survey (USGS) maintains two flow gaging stations on the Ipswich River. One is located in south Middleton and the other is located downstream at the Willowdale Dam in Ipswich. The average discharge at the south Middleton gage is 69 cfs, while the average discharge at the Ipswich gage is 198 cfs.

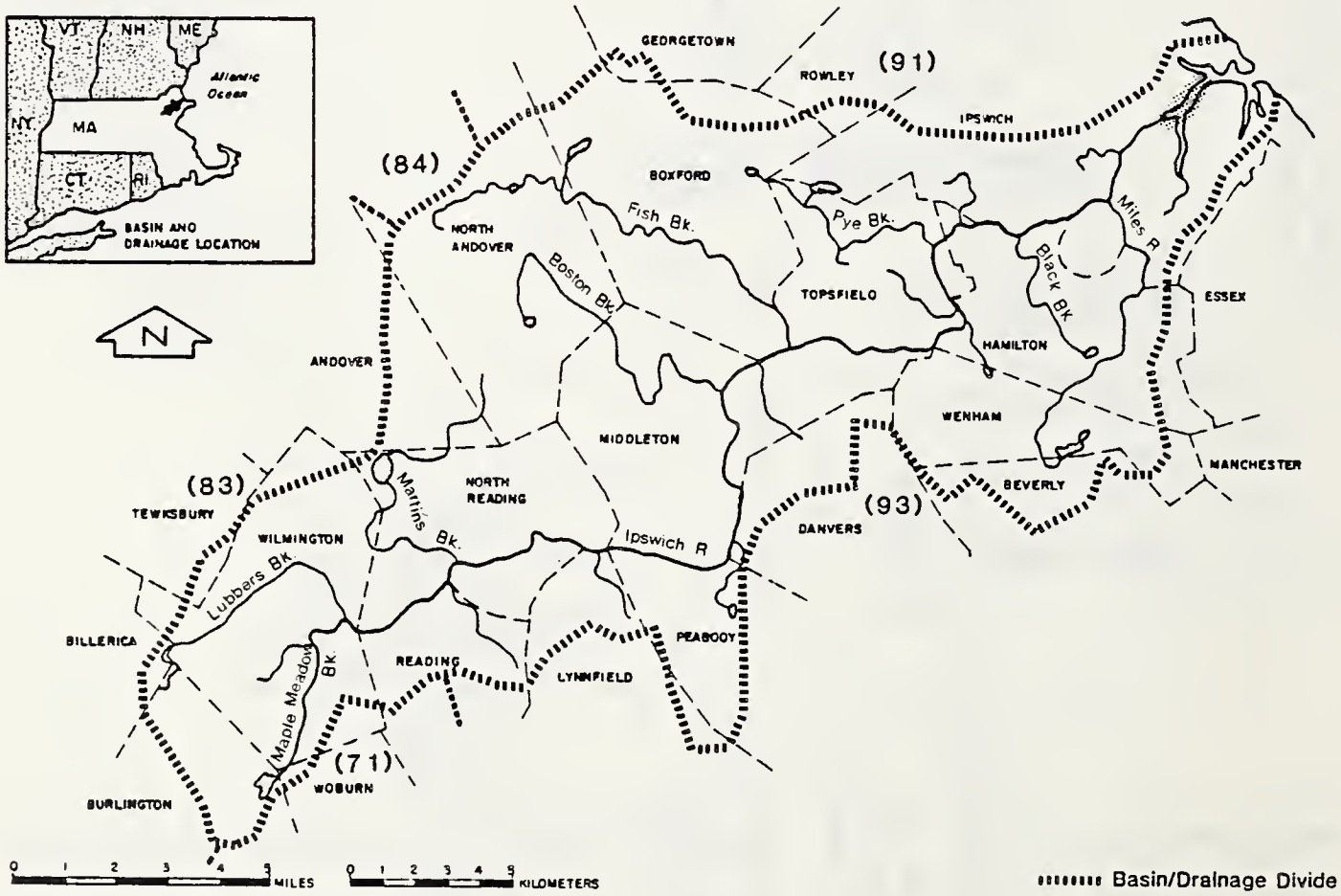


TABLE 32

IPSWICH RIVER BASIN
DRAINAGE AREA 92

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
From its source in Wilmington to Sylvania Dam, Ipswich	41.1-4.5	B	No	1973 1978 1983	Occasional dissolved oxygen Coliform bacteria	Natural wetland condition. Stormwater. Untreated discharge.	Non-point control in North Reading.
Sylvania Dam, Ipswich to Ipswich Estuary	4.5-1.0	SA	No	1973 1978 1983	Coliform bacteria	Stormwater. Untreated discharges.	Program on-going to connect problem areas to WWTP.
Ipswich Estuary	1.0-0.0	SA	Yes	1982 1983	Coliform bacteria	Untreated discharges.	Program on-going to connect problem areas to WWTP.

Total miles assessed - 41.1
Total miles meeting standards - 40.1

NORTH SHORE DRAINAGE BASIN (93)

The North Shore drainage area extends from the Essex River to Boston Harbor. The thirteen cities and towns in the area range from highly urbanized Lynn, Salem, and Beverly to rural Manchester and Essex. The total drainage area is 137.9 square miles.

The major rivers are the Essex River in Essex, the Annisquam River in Gloucester, Danvers River in Danvers, and the Saugus and Pines Rivers in Saugus. Important harbors and bays are located in Essex, Rockport, Gloucester, Manchester, Beverly, Salem, Marblehead, Nahant, and Lynn.

The Massachusetts Ocean Sanctuary Act (M.G.L. Chapter 132A, § 13-18, and as appended in Chapter 822) protects Essex Bay, Rockport Harbor, Gloucester Harbor, Beverly Harbor, Salem Harbor, Marblehead Harbor, and other marine waters designated by the Act. The Act prohibits, for example, construction in and discharges to the ocean.

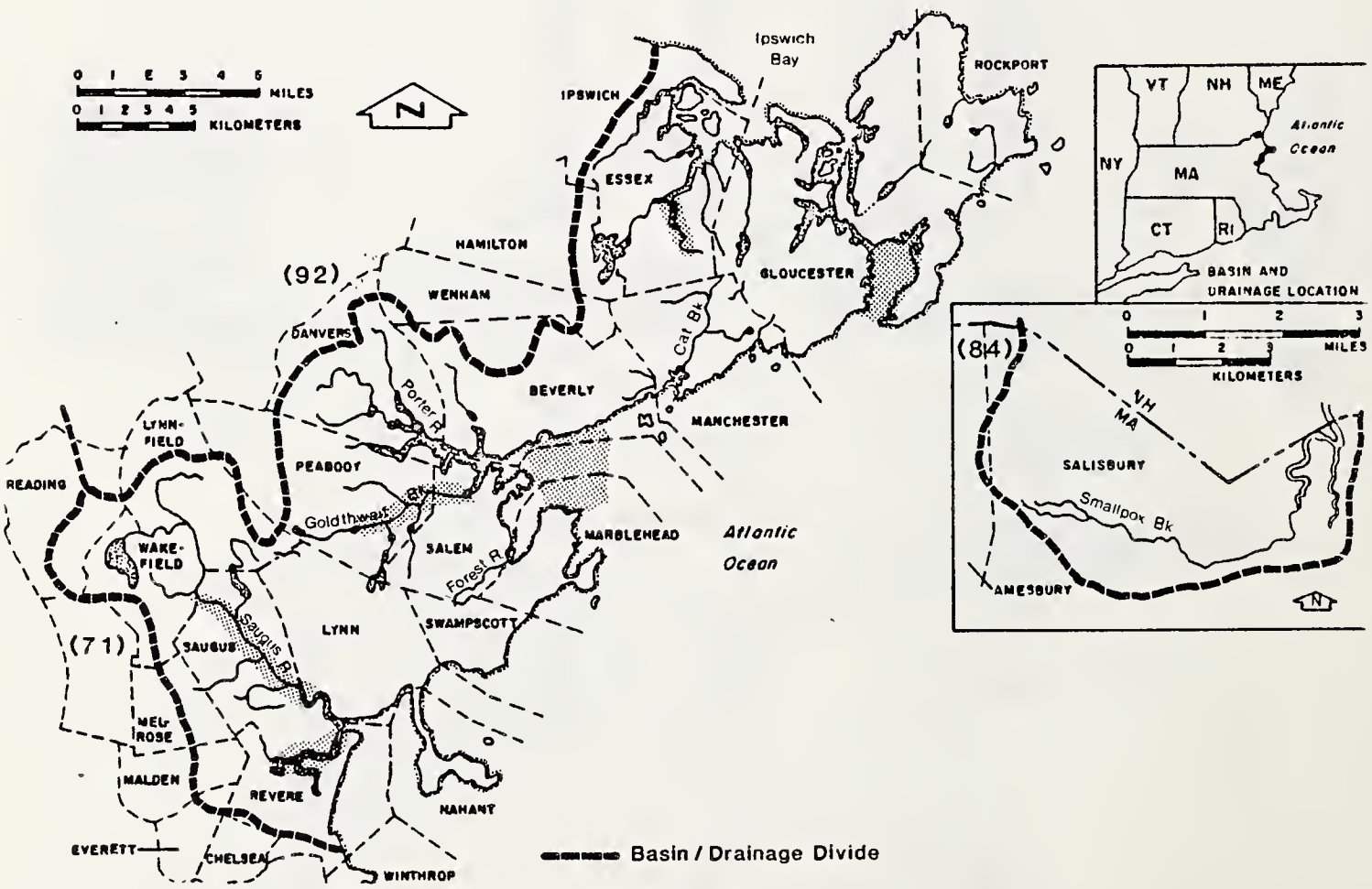


TABLE 33

NORTH SHORE BASIN
DRAINAGE AREA 93

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Essex River from source to mouth	4.9-0.0	SA	Yes	1976	Coliform bacteria	Unknown	--
Annisquam River from source to mouth	3.6-0.0	SA	No	1979	--	--	--
Danvers River from source to mouth	1.9-0.0	SB	No	1976	--	--	--
Saugus River from source to mouth	8.6-0.0	SB	Yes	1976 1978 1982	Coliform bacteria Dissolved oxygen Metals	Unknown	--
Pines River from source to mouth	6.4-0.0	SB	Yes	1976	Coliform bacteria	Unknown	--
North River from source to mouth	3.1-0.0	SB	Yes	1976	Coliform bacteria	Unknown	--
Essex Bay	1.15 mi^2	SA	Unknown	--	--	--	--
Rockport Harbor	0.019 mi^2	SB	Unknown	--	--	--	--
Gloucester Harbor	2.24 mi^2	SB	Yes	1979 1980 1982	Coliform bacteria Oil & grease Aesthetics	Untreated discharge, CSO.	Primary WWTP will be completed in 1984.

TABLE 33 (CONTINUED)

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Manchester Harbor	0.29 mi^2	SB	No	1983	--	--	--
Beverly Harbor	0.78 mi^2	SB	No	1976 1983	--	--	--
Salem Harbor	1.62 mi^2	SB	No	1976 1983	--	--	--
Marblehead Harbor	0.56 mi^2	SA	No	1976 1983	--	--	--
Lynn Harbor	6.67 mi^2	SB	No	1973 1976	--	--	--
Nahant Bay	5.27 mi^2	SA	No	1973	--	--	--
Salem Sound	10.01 mi^2	SB	Yes	1983	Coliform Nutrients Heavy metals	SESD not operating.	Sludge disposal problem needs solution.

Total square miles assessed - 27.44
Total square miles meeting standards - 15.19

Total linear miles assessed - 28.5
Total linear miles meeting standards - 5.5

SOUTH SHORE DRAINAGE BASIN (94)

The South Shore drainage area is located southeast of the metropolitan Boston area and includes all or part of the towns of Cohasset, Scituate, Marshfield, Duxbury, Kingston, Plymouth, and Plympton. The South Shore drainage area is tributary to Cape Cod Bay.

The North River Basin drains a total area of 105.4 square miles. The United States Geological Survey operates a gaging station at Curtis Crossing which drains 30.3 square miles. Over the last 14 years the gage has recorded an average flow of 62.5 cubic feet per second (cfs) with maximum and minimum flows of 1,390 cfs and 0.14 cfs, respectively.

The Jones River originates at the outlet of Silver Lake in Kingston and flows in a east-southeasterly direction for approximately seven miles to Plymouth Bay. In addition to the Jones River, several other small streams, including the Eel, Bluefish, Duck Hill, and South Rivers and Beaver Dam, Indian, and Town Brooks discharge to Cape Cod Bay. As is characteristic of most coastal streams, only minimal elevation changes occur as these streams meander their way to the Atlantic Ocean.

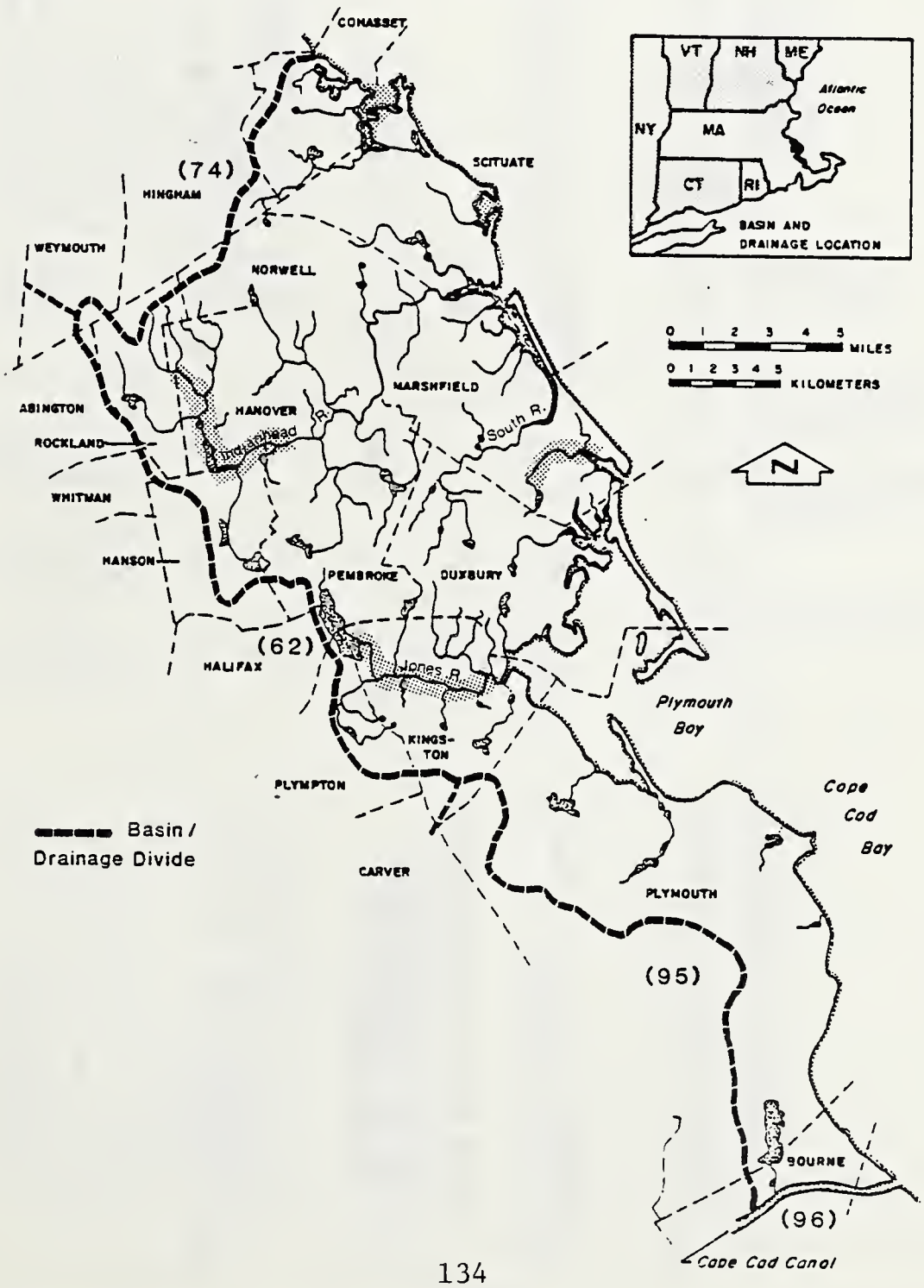


TABLE 34

SOUTH SHORE BASIN
DRAINAGE AREA 94

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Cohasset Harbor, Cohasset	0.83 mi^2	SA	Yes	1976	Coliform bacteria	Cohasset WWTP.	Upgrade Cohasset WWTP to provide secondary treatment.
Scituate Harbor, Scituate	0.31 mi^2	SA	Yes	1976	Coliform bacteria	Unknown	Eliminate/treat source.
North River from Weymouth Naval Air Station to North Abington WWTP, North Abington	23.2-19.5	B	No	1977	--	--	--
North River from North Abington WWTP to Curtis Crossing Dam, Hanover-Pembroke	19.5-11.6	B	Yes	1971 1975 1977 1983	Coliform bacteria Oxygen depletion Nutrients Solids	Rockland WWTP. Wetlands.	Advanced treatment at Rockland WWTP. North Abington WWTP tie in to Rockland WWTP.
North River from Curtis Crossing Dam to Third Herring Brook, Hanover-Norwell	11.6-9.9	SB	No	1971 1975 1983	Occasional coliform bacteria & dissolved oxygen	Runoff. Wetlands.	--
North River from Third Herring Brook to Massachusetts Bay	9.9-0.0	SA	No	1971 1975 1983	Occasional coliform bacteria	Runoff. Wetlands.	--
South River (entire length)	10.6-0.0	SA	No	1971 1975 1983	Coliform bacteria Solids	Septic systems. Wetlands.	--

TABLE 34 (CONTINUED)

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Green Harbor River, Marshfield	2.5-0.0	B	Yes	1976	Dissolved oxygen Nutrients Coliform bacteria	Natural wetlands. Failing septic systems.	Septic system rehabilitation/maintenance.
Jones River from source to Elm Street, Kingston	7.0-2.5	B	Yes	1976 1981	Occasional dissolved oxygen	Natural wetlands. Failing septic systems.	Septic system rehabilitation/maintenance.
Jones River Estuary, Kingston	2.5-0.0	SA	Yes	1976 1981	Coliform bacteria	Untreated domestic wastewater discharges.	Eliminate/treat sources.
Duxbury Bay, Kingston	13.46 mi^2	SA	No	1976	None	None	--
Plymouth Harbor, Plymouth	2.61 mi^2	SA	Yes	1976	Coliform bacteria	Plymouth WWTP. Combined sewer overflows. Boating discharges.	Treatment/Elimination of known sewage outfalls to harbor.
Plymouth Bay, Plymouth	--	SA	No	1976	--	--	--

Total linear miles assessed - 43.3
Total linear miles meeting standards - 25.9

Total square miles assessed - 17.21
Total square miles meeting standards - 13.46

BUZZARDS BAY DRAINAGE BASIN (95)

The Buzzards Bay Basin is formed by seven major coastal river basins which discharge their waters to the Massachusetts coastline from Bourne to Westport. The Cape Cod Canal determines the eastern border of the basin, while the Rhode Island state line defines the western border. From east to west, the major river basins are: Agawam, Wankinco, Weweantic, Mattapoisett, Acushnet, Paskamanset/Slocums, and Westport. The Buzzards Bay Basin has an approximate drainage area of 350 square miles.

The straight-line distance of the Buzzards Bay coastline is 32 miles, but its actual total length is 210 miles when all the unconformities are accounted for. The numerous harbors and coves formed by the jagged coastline are used extensively for recreational and commercial purposes. New Bedford Harbor, which is famous for its whaling history, is the industrial and commercial center of the basin and, in turn, suffers the most severe water quality problems.

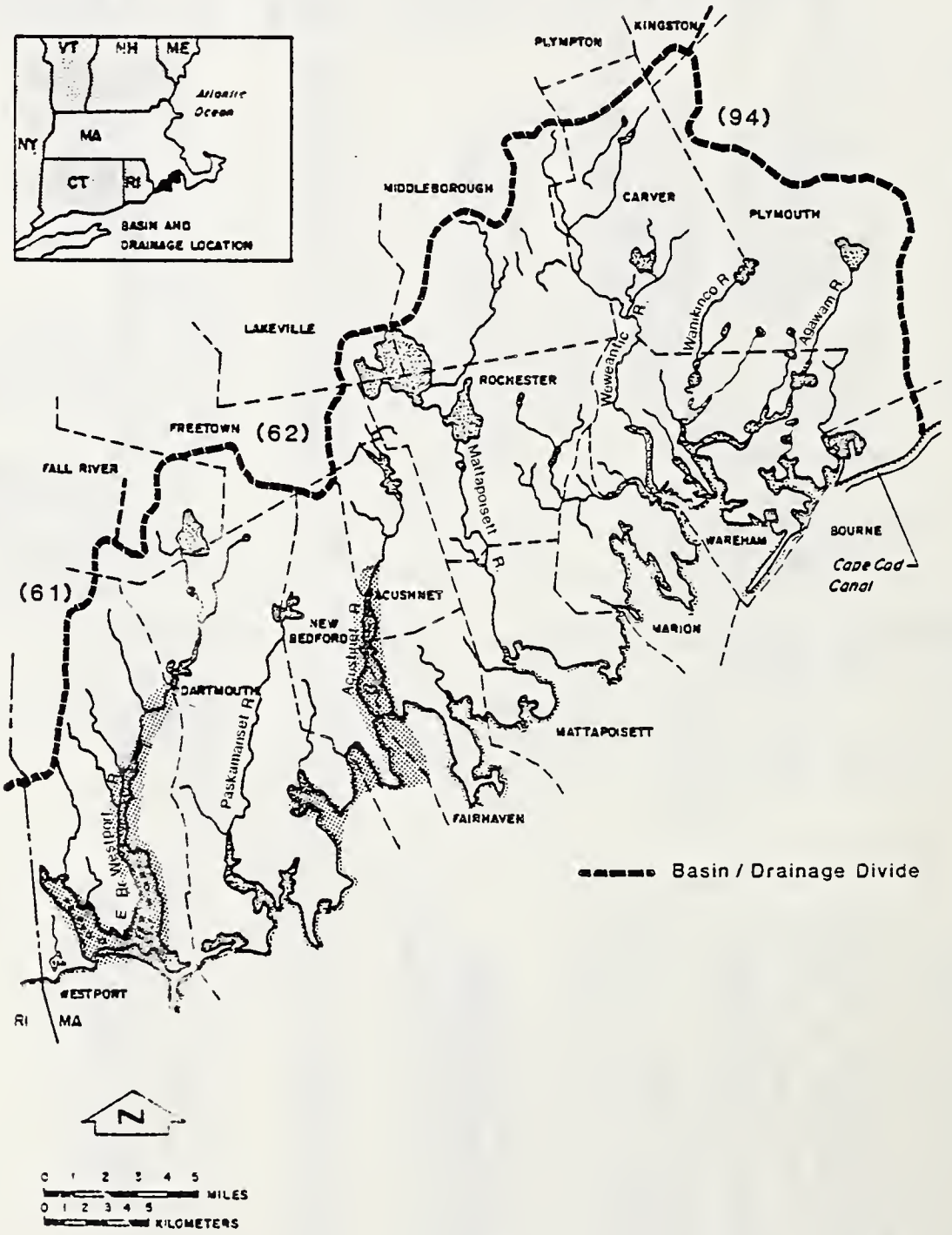


TABLE 35

BUZZARDS BAY BASIN
DRAINAGE AREA 95

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Buttermilk Bay	0.74 mi^2	SA	No	1975	--	--	--
Onset Bay	--	SA	No	1975	--	--	--
Wareham River	2.6-0.0	SA	No	1975	--	--	--
Weweantic River, downstream Horseshoe Pond	4.4-0.0	SA	No	1975	--	--	--
Sippican River, County Road to mouth	2.1-0.0	SA	No	1975	--	--	--
Sippican Harbor	2.76 mi^2	SA	No	1975	--	--	--
Aucoot Cove	--	SA	No	1975	--	--	--
Mattapoisett Harbor	1.02 mi^2	SA	No	1975	--	--	--
Westport River, West Branch	4.5-0.0	SA	Yes	1975 1983	Coliform bacteria	Agricultural runoff.	--
Westport River, East Branch from outlet of Noquochoke Lake to Old County Road, Westport	12.0-10.0	B	Yes	1975	Coliform bacteria	Undefined.	Determine current water quality; make appropriate abatement program.
Westport River, East Branch from County Road to mouth	10.0-0.0	SA	Yes	1975	Periodic coliform	Undefined.	Determine current water quality; make appropriate abatement program.

TABLE 35 (CONTINUED)

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Outer New Bedford Harbor	--	SA	Yes	1971 1975 1980	Periodic coliform PCB Dissolved oxygen	WWTP. Sediment.	Upgrade WWTP. Control PCB situation.
Clark Cove	1.15 mi^2	SA	Yes	1975	Periodic coliform	CSO.	CSO control.
Apponagansett Bay	0.91 mi^2	SA	Yes	1975	Periodic coliform	Undefined.	Determine current water quality; make appropriate abatement program.
Acushnet River from Hamlin Road to Main Street	5.5-4.5	B	Yes	1975	Dissolved oxygen Coliform bacteria	Dairy.	Correct runoff from farm.
Acushnet River from Main Street to Route 6 , New Bedford	4.5-1.0	SB	Yes	1971 1975 1980	Dissolved oxygen Coliform bacteria Heavy metals PCB	CSO. Sediment. Residuals.	Control of CSO. Control PCB in sediment.
New Bedford Inner Harbor	1.0-0.0	SB	Yes	1971 1975 1980	Dissolved oxygen Coliform bacteria Heavy metals PCB	CSO. Sediment. Residuals.	Control of CSO. Control PCB in sediment.
Agawam River	10.6-0.0	B	No	1975	--	--	--
Wankinco River	4.5-0.0	B	No	1975	--	--	--
Weweantic River, above Horseshoe Pond, Carver	12.2-4.4	B	No	1975	--	--	--

TABLE 35 (CONTINUED)

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Sippican River, above County Road, Marion	6.8-2.1	B	No	1975	--	--	--
Mattapoisett River	9.5-0.0	B	No	1975	--	--	--
Achusnet River to Hamlin Road, Achusnet	8.2-5.5	B	No	1975	--	--	--
Paskamanset River	9.6-0.0	B	No	1975	--	--	--
Shingle Island River	5.2-0.0	B	No	1975	--	--	--

Total river miles assessed - 85.7
Total miles meeting standards - 63.7
Total square miles assessed - 6.58
Total square miles meeting standards - 4.52

CAPE COD DRAINAGE AREA (96)

Cape Cod consists of 15 towns with a permanent 1980 population of 144,000. Its total area is 410 square miles of which 17 are covered by lakes and ponds. The Cape is devoid of any long rivers and streams. Herring River, six miles in length, is the longest river on Cape Cod.

Although there are only a few small freshwater streams, ponds and lakes are abundant on Cape Cod. Most ponds are relics from the last period of glaciation which ended approximately 15,000 years ago. The ponds are often the result of the depressions intersecting the groundwater table. The groundwater is naturally low in nutrients and is slightly acidic. The Massachusetts Division of Fisheries and Wildlife has, on occasion, added lime to some ponds to neutralize them and to increase the productivity of fisheries.

Cape Cod is renowned for its beaches, swimming and other water based activities. Shellfishing, both recreational and commercial, is a large scale endeavor.

The groundwater system, which expresses itself at the surface in ponds, is the most important freshwater resource on the Cape. Groundwater is the water supply source for all drinking water on Cape Cod and is also the eventual receiving water for discharges from the few municipal and other treatment plants which now exist along with all of the individual home disposal systems.

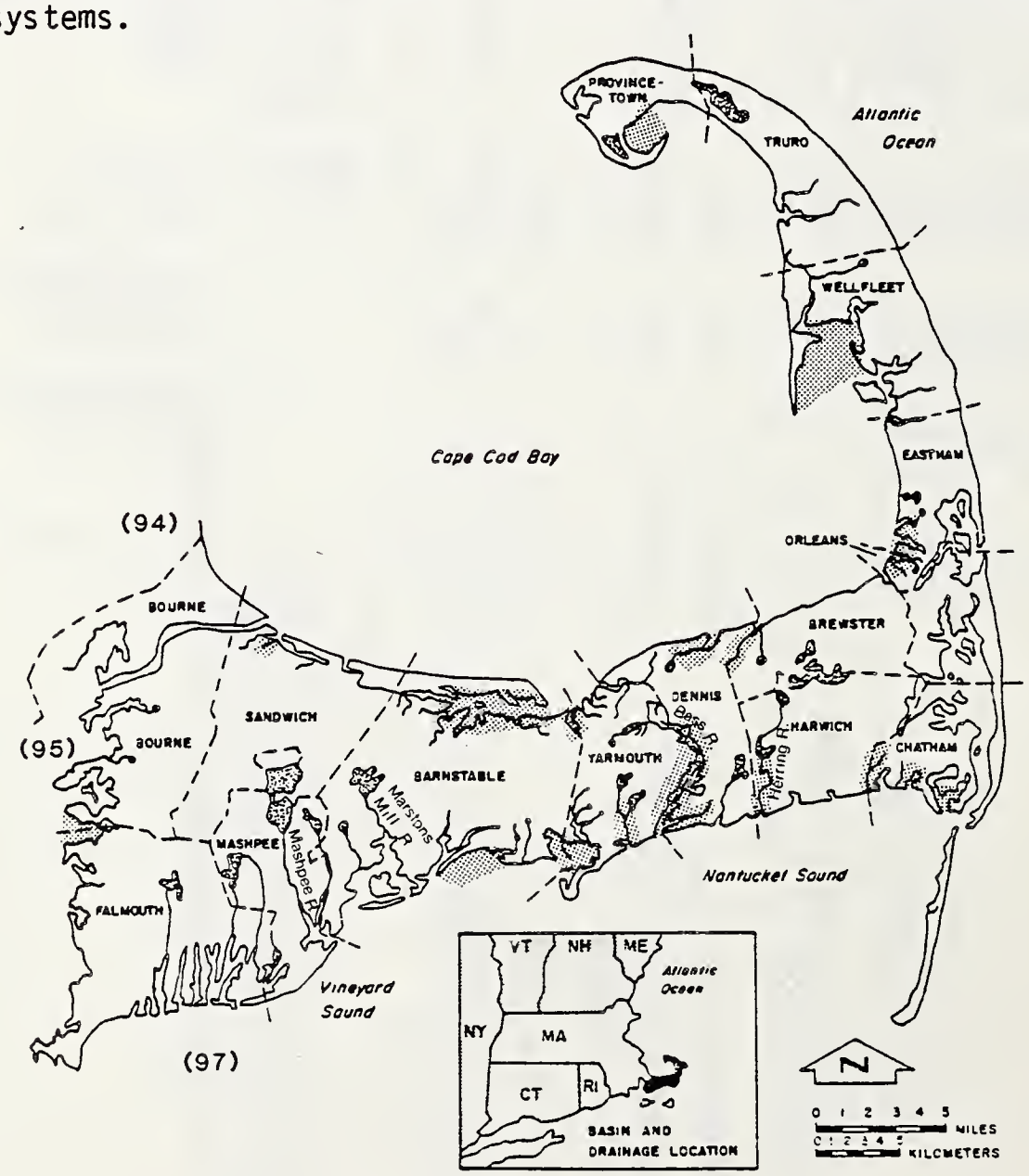


TABLE 36

CAPE COD DRAINAGE BASIN
DRAINAGE AREA 96

SEGMENT DESCRIPTION	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Segments given below:	SA	No	1976	--	--	--
Old Harbor Creek, Scorton Creek, Namskaket Creek, Herring River, Pamet River, Frostfish Creek, Swan Pond River, Herring Brook, Red Brook, Nauset Harbor (2.0 mi^2), Chatham Harbor (6.06 mi^2), Hyannis Harbor (0.47 mi^2), Waquoit Bay (1.54 mi^2), Little Harbor (0.05 mi^2), Great Harbor (0.35 mi^2), Quisset Harbor (0.15 mi^2), West Falmouth Harbor (0.28 mi^2), Phinney's Harbor (1.46 mi^2).						
Segments given below:	SA	Yes	1976	Coliform bacteria	Faulty septic systems.	Septic system rehabilitation. Facilities planning in Sandwich, Bourne, Orleans, and Chatham. Falmouth WWTP construction.
Mill Creek, Chase Garden Creek, Parkers River, Sesuit Creek, Quivett Creek, Little Namskaket Creek, Red River, Herring River, Barnstable Harbor (2.56 mi^2), Lewis Bay (1.35 mi^2), Centerville Harbor (1.44 mi^2).						
Segments given below:	SA	Yes	1976	Coliform bacteria Dissolved oxygen Nutrients	Faulty septic systems. Urban runoff. Heavy boat use.	Septic system rehabilitation. Facilities planning in Chatham. Falmouth WWTP construction.
Rock Harbor Creek, Boat Meadow River, Bass River, Wellfleet Harbor (7.27 mi^2), Provincetown Harbor (3.82 mi^2), Stage Harbor (0.86 mi^2), Megansett Harbor (1.39 mi^2).						
Dock Creek, Sandwich	SA	Yes	1976	Coliform bacteria Dissolved oxygen Ammonia-nitrogen	Faulty septic systems. Urban runoff.	Septic systems rehabilitation. Facilities planning.

TABLE 36 (CONTINUED)

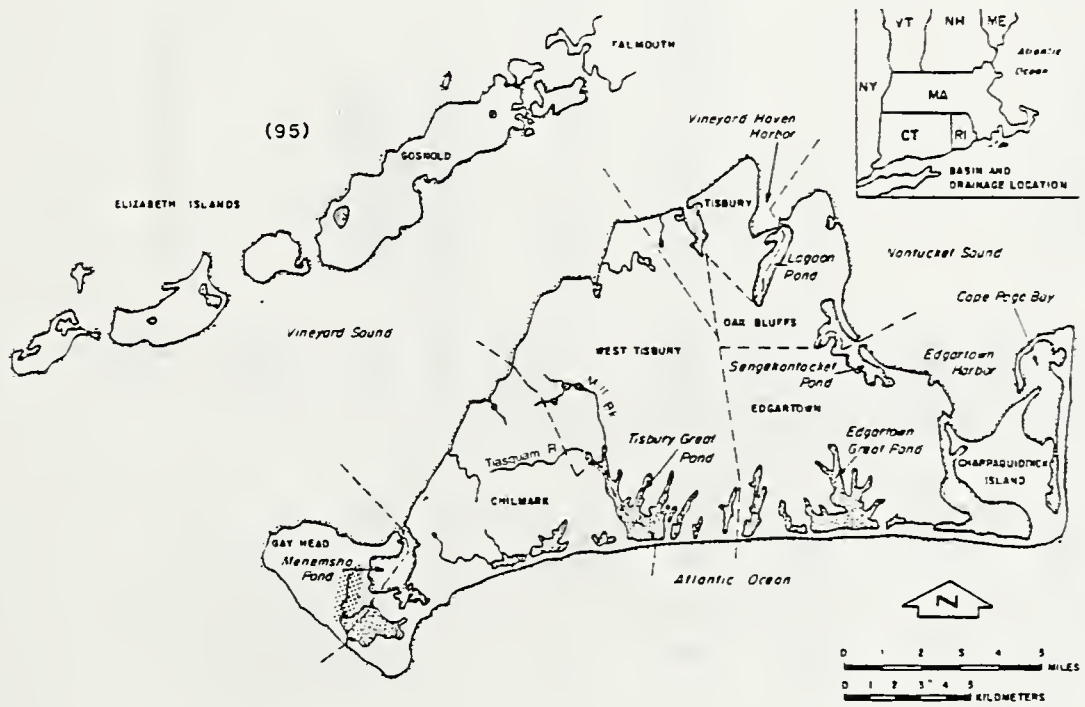
SEGMENT DESCRIPTION	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Buck Creek, Chatham	SA	Yes	1976	Coliform bacteria Dissolved oxygen	Faulty septic systems. Natural conditions.	Upgrade Chatham sewerage and treatment systems.
Cape Cod Canal (Sandwich); Cape Cod Canal (Bourne);	SB	No	1976	--	--	--

Total number of river segments assessed - 24
Total number of segments meeting standards - 11
Total square miles assessed - 31.05
Total square miles meeting standards - 12.36

THE ISLANDS DRAINAGE AREA (97)

The Islands drainage areas include those of Nantucket, Martha's Vineyard, and the Elizabeth Islands, all located off the southern coast of Cape Cod. These islands collectively exhibit similar geological patterns, water resources and water quality problems. Ponds constitute the major type of surface freshwater resources and groundwater is the sole source of domestic water supply.

Nantucket is an island comprising 49.5 square miles, 94 miles of coastline and with a maximum elevation of about 100 feet. Martha's Vineyard is an island consisting of six towns. It has a total surface area of 105.9 square miles, 125 miles of shoreline, and a maximum elevation of approximately 130 feet. One town, Gosnold is located on the separate Elizabeth Islands. All of the islands have small wintertime populations that swell to much larger numbers during the summer vacation season.



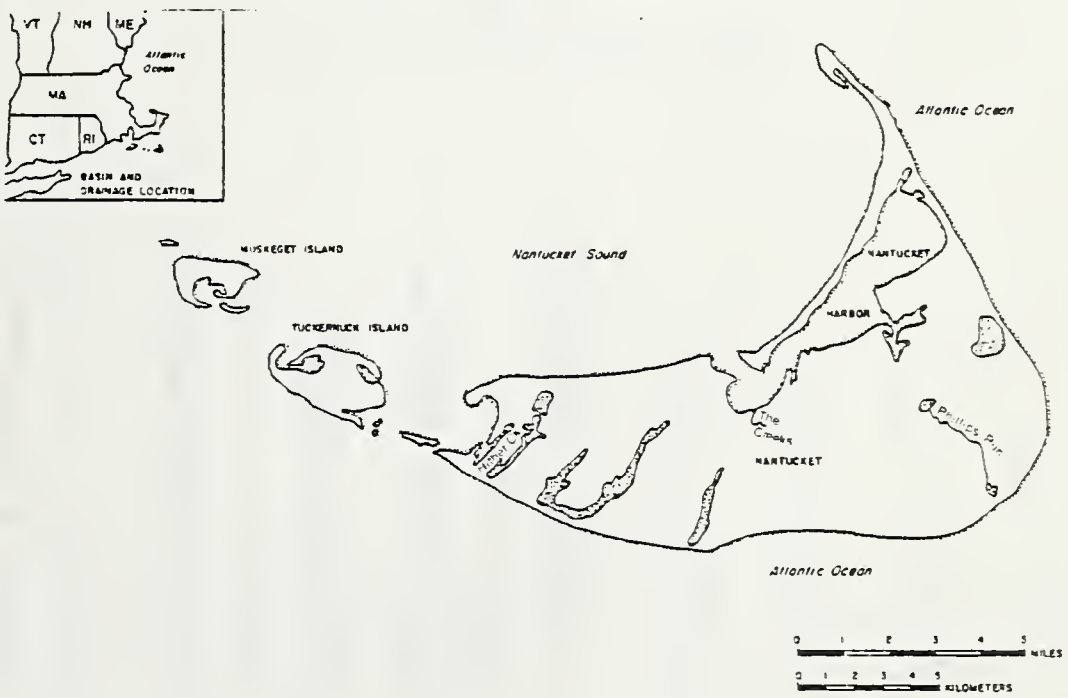


TABLE 37

ISLANDS BASIN
DRAINAGE AREA 97

SEGMENT DESCRIPTION	HARBOR AREA	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Nantucket Harbor	7.65 mi^2	SA	No	1978	--	--	--
Hummock Pond, Nantucket	--	B	No	1978	--	--	--
Maxcy Pond, Nantucket	--	B	No	1978	--	--	--
Washing Pond, Nantucket	--	B	No	1978	--	--	--
Miacomet Pond, Nantucket	--	B	No	1978	Coliform bacteria	Failing septic systems.	Proper maintenance of subsurface disposal systems.
Tom Nevers Pond, Nantucket	--	B	No	1978	--	--	--
Gibbs Pond, Nantucket	--	B	No	1978	Nutrients	Unknown	--
Sesachacha Pond, Nantucket	--	SA	No	1978	Nutrients	Natural	--
Chilmark Pond, Martha's Vineyard	--	SA	No	1975 1976	--	--	--
Menemsha Pond, Martha's Vineyard	--	SA	No	1975 1976	Coliform bacteria	Failing septic systems.	Proper maintenance of subsurface disposal systems.
Oak Bluffs Harbor, Martha's Vineyard	--	SA	No	1975 1976	--	--	--

TABLE 37 (CONTINUED)

SEGMENT DESCRIPTION	HARBOR AREA	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Vineyard Haven Harbor, Martha's Vineyard	1.47 mi^2	SA	No	1975 1976	Coliform bacteria	Failing septic systems.	Septic system maintenance.
Sengekontacket Pond, Martha's Vineyard		SA	No	1975 1976	Coliform bacteria	Failing septic systems.	Septic system maintenance.
Duarte Pond, Martha's Vineyard		B	No	1975 1976	--	--	--
Lake Tashmoo, Martha's Vineyard		SA	No	1975 1976	--	--	--
Cories Pond, Martha's Vineyard		B	No	1975 1976	--	--	--
Maltakeset Bay, Martha's Vineyard		SA	No	1975 1976	--	--	--
Black Brook, Martha's Vineyard		B	Yes	1975 1976	Solids Heavy metals	Landfill suspect.	--
Mill Brook, Martha's Vineyard		B	No	1975 1976	--	--	--
Roaring Brook, Martha's Vineyard		B	No	1975 1976	--	--	--
Paint Mill Brook, Martha's Vineyard		B	No	1975 1976	--	--	--

TABLE 37 (CONTINUED)

SEGMENT DESCRIPTION	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Tiasquam River, Martha's Vineyard	B	No	1975 1976	Solids	Septic system failures.	Septic system maintenance.
Smith Brook, Martha's Vineyard	B	No	1975 1976	--	--	--

Total number of segments assessed - 23
Total number of segments meeting standards - 22
Total square miles assessed - 9.12
Total square miles meeting standards - 9.12

6703

ACME
BOOKBINDING CO., INC.

JUL 5 1990

100 CAMBRIDGE STREET
CHARLESTOWN, MASS